NASA SP-7041 (06)

EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

ISSUE 6

DECEMBER 1975

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7041(06) Earth Resources Pages 83–149 DECEMBER 1975

PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES

Remote Sensing of Earth Resources	(NASA SP-7036(01))
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Earth Resources	(NASA SP-7041(03))
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Earth Resources	(NASA SP-7041(05))

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NASA SP-7041 (06)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 6

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between April 1975 and June 1975 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DECEMBER 1975
Washington, D.C.

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INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 484 reports, articles, and other documents announced between April and June 1975 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

IAA entries identified by accession number series A75-10,000 in ascending accession number order;

STAR entries identified by accession number series N75-10,000 in ascending accession number order.

After the abstract section, there are five indexes:

subject, personal author, corporate source, contract number and report/accession number.

AVAILABILITY OF CITED PUBLICATIONS

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All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the "#" symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g. (A75-18063), when requesting publications.

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Subject Categories

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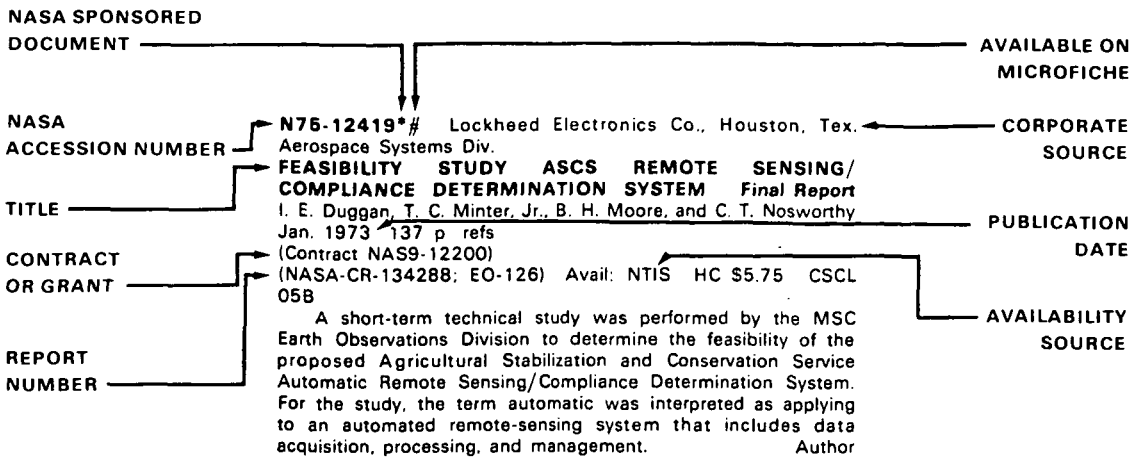
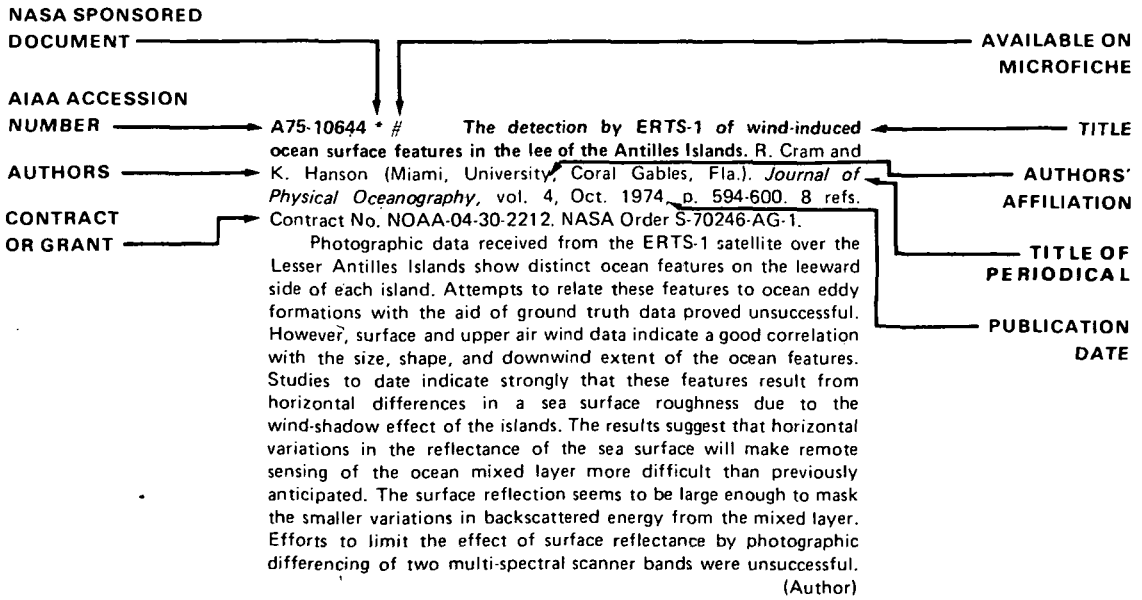
TYPICAL CITATION AND ABSTRACT FROM *STAR*



TYPICAL CITATION AND ABSTRACT FROM *IAA*



EARTH RESOURCES

A Continuing Bibliography (Issue 6)

DECEMBER 1975

01
AGRICULTURE AND FORESTRY

Include crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

A75-21021 * Detecting disturbances in a forest environment. R. C. Aldrich (U.S. Forest Service, Berkeley, Calif.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Jan. 1975, p. 39-48. NASA Order S-70251-AG.

The interchange between forest and nonforest land and most man-made and natural forest disturbances can be detected on 1:120,000-scale color-infrared film. Bulk multispectral scanner imagery from the Earth Resources Technology Satellite combined and enhanced at a scale of 1:1,000,000 shows major changes in forest and nonforest land-use categories, many timber harvested areas, and some natural disturbances. Late fall to late spring is the best period of the year for detecting forest disturbances. In a study in Georgia, 79 percent of the disturbances in one county were detected on an ERTS color composite for April 1973 with only 12 percent commission error. (Author)

A75-21257 * Use of ERTS-1 data to detect chlorotic grain sorghum. H. W. Gausman, A. H. Gerbermann, and C. L. Wiegand (U.S. Department of Agriculture, Agricultural Research Service, Weslaco, Tex.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Feb. 1975, p. 177-179, 181. 8 refs. NASA Order R-09-038-002.

A75-21258 In situ rock reflectance. G. L. Raines and K. Lee (Colorado School of Mines, Golden, Colo.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Feb. 1975, p. 189-198. 5 refs.

The purposes of this paper are to summarize, generalize, and give a statistical model of sedimentary rock reflectance data measured in situ. The data consist of more than 8600 measurements along the Front Range of Colorado. The typical spectral reflectance curve for a geologic formation shows a gradual increase of spectral reflectance with increasing wavelength. Extrapolation of measured values from one area to another is valid; however, the geologic exposure may change and must be considered for best filter selection. It is concluded that 'best' spectral bands cannot be selected with sufficient confidence in a practical manner with current techniques and equipment. (Author)

A75-22537 # Mapping of natural vegetation distribution over Central Eastern Brazil from data obtained by ERTS-1. M. K. Nosseir, G. T. Batista, and C. V. B. Palestino (Instituto de Pesquisas Espaciais, São José dos Campos, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 190-213. 15 refs.

A75-22725 * Wheat - Its growth and disease severity as deduced from ERTS-1. E. T. Kanemasu, C. L. Niblett, H. Manges, D. Lenhert, and M. A. Newman (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Remote Sensing of Environment,* vol. 3, no. 4, 1974, p. 255-260. NASA-supported research.

The spectral reflectance of a cropped surface changes as the plant develops. An indicator of crop growth is leaf area index (ratio of green leaf area to soil area). The leaf area index, disease severity, and yield were determined for several winter wheat fields in Kansas during the 1973 growing season. Multispectral scanner (MSS) data from Earth Resources Technology Satellite-1 (ERTS-1) showed a high correlation (r greater than or equal to 0.90) between crop growth and MSS4/MSS5, and crop growth and MSS5/MSS6. Wheat disease severity and yields were significantly correlated at the 5% level with MSS4/MSS6 and with MSS4/MSS7. Further investigation is required before ERTS imagery can be routinely used detecting and estimating disease severity and yield reduction. (Author)

A75-23016 Remote sensing of natural formations from measurements of radiance coefficients. K. Ia. Kondrat'ev, O. B. Vasil'ev, O. M. Pokrovskii, and G. A. Ivanian (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Acta Astronautica,* vol. 1, Nov.-Dec. 1974, p. 1415-1426. 9 refs.

This paper is devoted to the consideration of some problems of remote sensing of natural formations using radiance coefficients in the narrow spectral invervals. The techniques for the determination of the most informative spectral intervals, as developed by the authors of the paper, are given and the results obtained are presented. The technique for obtaining the training sample of spectral radiance coefficients, with the help of a four-objective camera applied by the authors, is described. Some problems regarding the construction of a 'universal' alphabet for classes of natural formations are discussed. (Author)

A75-23147 # Pedology and teledetection (Pedologie et télédétection). M.-C. Girard (Institut National Agronomique de Paris-Grignon, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 445-456. 6 refs. In French.

Possible applications of teledetection in the field of pedology are detailed. Characteristics that might be detected include reflectance, tilings, color, some chemical elements (iron, organic matter, CaCO3), granulometry, and flooding. Factors of the soil only indirectly detectable are also discussed. A methodology of photointerpretation is given. S.J.M.

A75-23149 # Agronomy and teledetection (Agronomie et télédétection). C.-M. Girard (Institut National Agronomique de Paris-Grignon, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 463-475. In French.

It is shown how teledetection yields information about the species, acreage and health of crops, as well as about the nature of the soil and the microclimate. Two examples are analyzed in order to demonstrate this: an aerial infrared photograph and a recording of radiation in the 10.5-12.5 micron band. S.J.M.

A75-23749 * Effects of leaf age within growth stages of pepper and sorghum plants on leaf thickness, water, chlorophyll, and light reflectance. H. W. Gausman, R. Cardenas, and A. Berumen (U.S.

Department of Agriculture, Agricultural Research Service, Weslaco, Tex.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 39-56. 17 refs. NASA Order R-09-038-002.

Pepper and sorghum plants (characterized by porous and compact leaf mesophylls, respectively) were used to study the influence of leaf age on light reflectance. Measurements were limited to the upper five nodal positions within each growth stage, since upper leaves make up most of the reflectance surfaces remotely sensed. The increase in leaf thickness and water content with increasing leaf age was taken into consideration, since each of these factors affects the reflectance as well as the selection of spectral wavelength intervals for optimum discrimination of vegetation. V.P.

A75-23750 Extraction of the underlying soil spectra from canopy spectroreflectance measurements of the shortgrass prairie. C. J. Tucker and L. D. Miller (Colorado State University, Fort Collins, Colo.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 73-83. NSF Grants No. GB-7824; No. GB-13096; No. GB-31862X; No. GB-31862X2; No. GB-41233X.

The statistical method described was developed to extract the underlying soil spectra from in situ composite canopy spectroreflectance of rangelands. The methodology involves ground-truth sampling of one of several biophysical plot parameters and the composite canopy spectroreflectance measured in the 0.350 to 0.800 micron region at ninety one 0.005 micron wavelength intervals. A general linear regression model is used where the estimated spectroreflectance is expressed as a constant plus the product of a conditional variable coefficient multiplied times the biophysical plot parameter. The least squares regression constants from the linear equation are an accurate estimator of the underlying soil spectra when expressed as a function of wavelength. V.P.

A75-23759 On determining field drainage characteristics by use of a multispectral point scanning system. G. E. Murine (Actron Industries, Inc., Monrovia, Calif.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 223-232.

Land use classification using an airborne Actron HMS564X Multispectral Point Scanner is described. Crop classification and soil salinity content measurements were made at 12,000 ft over the Imperial Valley of California, during a flight devoted primarily to collecting data for an atmospheric study. Data are analyzed, corrected for the less than optimal conditions under which they were collected, and tabulated. It is found that accurate classification is possible with this method. Suggestions for future flights, including use of stabilized platforms, rate recording, and lower altitudes, are provided. F.G.M.

A75-23763 Some results of the agricultural remote sensing experiment near Poona. N. V. M. Unni and T. A. Hariharan (Indian Space Research Organization, Space Applications Centre, Ahmedabad, India). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 273-289.

Infrared and panchromatic photographs were taken from altitudes of 500 and 2000 m over agricultural areas in India in order to test the applications of multiband, multistage aerial photography for determining land use patterns, crop types, and soil conditions. Infrared photography was found to discriminate well between bare soil and soil under cultivation. Infrared false-color photography was effective for identifying major crops, including sorghum, sugar cane, onions, wheat, and lemons. A.T.S.

A75-23764 Some results of the agricultural remote sensing experiment at Karjat near Bombay. N. V. M. Unni and M. S. Dhanju (Indian Space Research Organization, Space Applications Centre, Ahmedabad, India). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 291-295.

The use of infrared photography for monitoring agricultural features from aircraft is described. A 6 km by 12 km area was photographed from a Dakota DC-3 during the summer of 1973. False coloring on the infrared photographs enabled observers to differentiate various crops and vegetables and to distinguish healthy crops from blighted ones. The causes of the color differences are noted. F.G.M.

A75-23765 * Densitometry of ERTS-1 imagery to access vegetation change. M. D. Ashley and J. Rea (Maine, University, Orono, Me.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 297-317. 14 refs. Contract No. NAS5-21781.

Density measurements of ERTS-1 multispectral scanner (MSS) imagery can be used to evaluate phenological changes in vegetation. It was found that the density ratios for MSS bands 5 and 7 best characterize vegetation change. The ratio increases with vegetative progression and decreases with vegetative recession. The use of a densitometer aperture as small as 0.4 mm does not adversely affect the accuracy of readings on forest sites. A.T.S.

A75-23766 Measurement of agricultural crops by remote spectral techniques. E. J. Brach (Engineering Research Service, Ottawa, Canada). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 319-337. 15 refs.

Utilization of remote spectral measurement for crop yield prediction, early disease warning, and accurate crop yield estimation is presented. The development of instruments to make remote sensed, nondestructive measurements of the infrared spectra of plants is outlined, and the classification and identification of detected plants is explained. The use of ERTS in a joint U.S.-Canadian project to estimate total spring wheat production is described. Data tables and charts are included. F.G.M.

A75-23768 * The use of small scale imagery for the location of pines infested by the southern pine beetle. M. S. Golden (Alabama A & M University, Huntsville, Ala.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 353-359. 12 refs. Grant No. NGR-01-001-023.

A75-23772 * Mapping a recent forest fire with ERTS-1 MSS data. H. C. Hitchcock and R. M. Hoffer (Purdue University, West Lafayette, Ind.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 449-461. 8 refs. Grant No. NGL-15-005-112.

Accurate fire boundary delineation provides essential information to forest managers in allocating suppression costs and planning regeneration efforts. The objective of this study was to test the

capability of computer-aided analysis of ERTS-1 MSS data to accurately define the boundary of a recent forest fire and to discriminate spectral classes within the perimeter. Two frames of ERTS-1 MSS data were selected for analysis of the Moccasin Mesa Fire in Mesa Verde National Park. Data sets were collected one-half growing season and one full growing season after the fire. Results indicate that computer-aided analysis of ERTS-1 MSS data has the capability for accurately delineating fire boundaries and determining acreage of the burned area. Distinct spectral classes may also be defined within the fire perimeter. (Author)

A75-23774 Computer analysis and mapping of gypsy moth defoliation levels in northeastern Pennsylvania using ERTS-1 data. D. L. Williams and B. J. Turner (Pennsylvania State University, University Park, Pa.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 487-501. Research supported by the McIntyre-Stennis Funds and Pennsylvania State University.

A75-23780 The delineation of forest habitat with remotely sensed data. T. K. Cannon and W. F. Miller (Mississippi State University, Jackson, Miss.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 587-596. 9 refs. Grant No. DACW01-72-C-0084.

Employment of remote sensing techniques to identify forest habitats along the proposed route of the Tennessee-Tombigbee Waterway is presented. The four NASA remote sensing missions that delineated the ecosystems and forest habitats are recounted, and the habitats, their indicator species, site components, and visual appearance are described. Correlation of the remote sensed data with data on wildlife and soil conditions, gathered in situ, aided the Army Corps of Engineers in route modification and spoil disposal planning. It is suggested that these procedures be explored and utilized in future projects of this nature. F.G.M.

A75-23783 * Use of ERTS-1 imagery in forest inventory. J. C. Rennie (Tennessee, University, Knoxville, Tenn.) and E. E. Birth (J. P. Hamer Lumber Co., Inc., Kenova, W. Va.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 671-684. 6 refs. Contract No. NAS5-21873.

The utility of ERTS-1 imagery when combined with field observations and with aircraft imagery and field observations is evaluated. Satellite imagery consisted of 9-1/2 inch black and white negatives of four multispectral scanner bands taken over Polk County, Tennessee. Aircraft imagery was obtained by a C-130 flying at 23,000 ft over the same area and provided the basis for locating ground plots for field observations. Correspondence between aircraft and satellite imagery was somewhat inaccurate due to seasonal differences in observations and lack of good photogrammetry with the data processing system used. Better correspondence was found between satellite imagery and ground observations. Ways to obtain more accurate data are discussed, and comparisons between aircraft and satellite observations are tabulated. F.G.M.

A75-23784 Remote sensing techniques for wildlife inventories in the coastal marsh - The muskrat. L. N. Doiron and R. T. Wilson (Louisiana State University, Baton Rouge, La.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 685-696. 13 refs.

A75-23789 Correspondence analysis of multiscanner data for vegetation classification. B. Lacaze (Centre d'Etudes Phytosociologiques et Ecologiques, Montpellier, France), J. P. Bordet, J. M. Monget (Paris, Ecole Nationale Supérieure des Mines, Paris, France), and J. Dulac (Centre National d'Etudes Spatiales, Paris, France). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 775-781.

An unsupervised classification algorithm of multispectral scanner data is described and a case study applying it is presented. The algorithm was designed using the new correspondence analysis multidimensional statistical method. It is organized into three steps: (1) correspondence analysis is used as a dimension reduction method in order to extract the main structural trends from the raw data; (2) a reduced space is defined in which the groups of channels most likely to characterize a typical reflectance spectrum shape are sought; (3) the output from the second step is used to initiate an adaptive clustering scheme for the measured reflectance spectra around moving class-centers. The classes derived from this procedure are well correlated with increasing levels of vegetation biomass. No a priori information is taken into account regarding the number of categories. S.J.M.

A75-24611 A new approach to terrestrial and photographic forest sampling - The use of a panoramic lens. B. Rhody (Swiss Forest Research Institute, Birmensdorf, Switzerland). *Photogrammetria*, vol. 30, Feb. 1975, p. 75-78, 81-85.

This paper presents a technique of forest sampling using a new panoramic lens. One to three photographs are taken from a levelled platform on a tripod at the sample plot center with a base length corresponding roughly to a tree diameter. These photos can be analyzed monoscopically, in part also stereoscopically. The present study deals primarily with the determination of the polar coordinates and the stem diameter of test trees. This panoramic sampling technique can aid in making a forest inventory more expedient. It can be used for combined aerial and terrestrial surveys as well as for the terrestrial control of pure aerial surveys. This new method is higher rated for its documentary value than conventional terrestrial photographs. Also, it serves to detect qualitative changes in forest stands at periodic intervals. (Author)

A75-24669 The use of satellite data in monitoring forest health and the spread of defoliating insects. T. D. Roberts, R. P. Swank (Advanced Technology Applications Corp., Paoli, Pa.), B. J. Turner, and D. Williams (Pennsylvania State University, University Park, Pa.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 14, 15. Research supported by the Pennsylvania State University.

The present work describes the use of multispectral scanner (MSS) imagery from the ERTS satellite in monitoring the spread of and the devastation caused by the gypsy moth, Porthetria dispara. General information on the gypsy moth and its mode of destruction of deciduous and evergreen trees is also provided. S.J.M.

A75-24672 * Anthropogenic desertification by high-albedo pollution - Observations and modeling. J. Otterman (NASA, Goddard Space Flight Center, Greenbelt, Md.), N. W. Rosenberg (USAF, Cambridge Research Laboratories, Bedford, Mass.), and E. Rosenberg (Tel Aviv University, Tel Aviv, Israel). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 34, 35.

ERTS-1 MSS albedo data of Western Negev, Sinai and the Gaza strip are presented. A sharp contrast in albedo exists across the

Negev-Sinai and Negev-Gaza strip borders. Anthropogenic desertification has occurred on the Arab side due to overgrazing and Bedouin agriculture, whereas natural vegetation grows much more abundantly on the Israeli side. S.J.M

A75-25644 # **Some questions of vegetation identification (Nekotorye voprosy identifikatsii rastitel'nosti).** V. I. Rachkulik and M. V. Sitnikova (Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby SSSR, Institut Eksperimental'noi Meteorologii, Obninsk, USSR). *Meteorologiia i Gidrologiia,* Jan. 1975, p. 85-88. 6 refs. In Russian.

The influence of soil and green mass on spectral brightness curves in soil-vegetation systems is investigated. Brightness coefficients obtained at wavelengths of 500, 550, 680, and 760 nanometers for wheat, corn, potatos, alfalfa, cotton plants, and barley are tabulated, and continuous brightness spectral curves are plotted for various masses of alfalfa on four soils with different reflective properties. It is shown that the character of the spectral brightness curve for a crop is determined by the spectral brightness curve of the soil, the amount of vegetation above ground, and the density of the vegetation cover. F.G.M.

A75-27326 Annual Conference on Remote Sensing in Arid Lands, 4th, University of Arizona, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974. 389 p. $15.

Papers are presented describing the use of remote sensing techniques in mapping land use, geological features, mineral and water resources, and environmental monitoring in the arid areas of the world. Some of the topics covered include image passive microwave radiometry as a data source for arid environment, automatic thematic mapping and change detection, use of radiometric information in geologic applications, radio techniques for geochemical remote sensing, and estimates of irrigation water demands from remote sensed imagery.

P.T.H.

A75-27330 * # **Preparing resource inventories in the Southern Great Plains by machine-processing of ERTS-1 multispectral data.** J. A. Henderson, Jr., M. F. Baumgardner, and C. F. Walker (Purdue University, West Lafayette, Ind.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 57-69. Contract No. NAS5-21785.

A75-27347 # **Application of color-infrared photography to evapotranspiration research.** J. E. Jones (U.S. Geological Survey, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 289-307. 12 refs.

Evapotranspiration is related to the water withdrawn from a land area by evaporation and by plant transpiration. During the 5-year period from 1967 to 1971, data from 36 color-infrared photographic missions flown by the U.S. Geological Survey over the Gila River Phreatophyte Project area were analyzed. In addition, data from two NASA photographic missions flown over the area were investigated. It was found that remote sensing offers an effective method for obtaining needed descriptive information regarding the surface conditions affecting evapotranspiration. G.R.

A75-27348 # **Development of forest stocking equations by multiple-stage remote sensing techniques.** H. R. Bisson, W. O. Rasmussen, and P. F. Ffolliott (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 308-313. 5 refs.

The methodologies employed to assess forest density conditions from high altitude imagery are examined. Attention is given to the existence of several alternatives related to the degree of sophistication in imagery analysis. A selection of the best methodology in a specific case requires an evaluation of these alternatives. Needed statistic parameter values can be obtained from solutions of forest stocking equations, which may be generated by applications of remote sensing techniques. G.R.

A75-27349 # **Image analysis techniques for timber mapping.** J. C. Leachtenauer, C. E. Elworth, and R. A. Schindler (Boeing Aerospace Co., Seattle, Wash.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 314-328.

Three image analysis techniques were evaluated for use in timber mapping. Classification accuracy using conventional photo interpretation was compared against that obtained using multispectral density evaluation and optical power spectrum analysis. Aerial Ektachrome and simulated ERTS three-band multispectral images flown by NASA over the Ft. Apache Reservation in S.E. Arizona at a scale of 1/117,000 were used to classify areas of pine, grass, and pinyon/juniper/chaparral. Multispectral density evaluation produced virtually no discrimination; conventional photo interpretation correctly identified 94% of grass areas but only 51% of the pine areas. Optical power spectrum analysis correctly identified from 80% to 95% of all three types of vegetation, specific accuracy depending on the data manipulation technique employed. (Author)

A75-27350 # **Ephemeral forage production determined from ERTS imagery.** G. Bentley (U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 329-337.

The amount of forage produced on approximately 11 million acres of public land in desert regions of California, Arizona, and New Mexico fluctuates within wide limits because of very uncertain climatic conditions. A study has been conducted to explore the possibility to employ satellite imagery in the solution of range management problems. It was found that satellite imagery may be useful in this connection. Recommendations are made for the implementation of a suitable approach. G.R.

A75-27351 * # **ERTS-1 imagery and native plant distributions.** H. B. Musick, W. McGinnies, E. Haase, and L. K. Lepley (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 338-346. NASA-supported research.

A method is developed for using ERTS spectral signature data to determine plant community distribution and phenology without resolving individual plants. An Exotech ERTS radiometer was used near ground level to obtain spectral signatures for a desert plant community, including two shrub species, ground covered with live annuals in April and dead ones in June, and bare ground. It is shown that comparisons of scene types can be made when spectral signatures are expressed as a ratio of red reflectivity to IR reflectivity or when they are plotted as red reflectivity vs. IR reflectivity, in which case the signature clusters of each component are more distinct. A method for correcting and converting the ERTS radiance values to reflectivity values for comparison with ground truth data is appended. F.G.M.

A75-27352 # **Interpretation of space-acquired signatures for desert plant species.** C. H. Lowe and D. M. Slaymaker (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 347, 348.

A75-27353 * # **Computer classification of range vegetation - ERTS-1 MSS vs floristic.** W. T. Pyott (Oregon State University,

Corvallis, Ore.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p.351-358. Contract No. NAS5-21831.

A75-27354 # **Remote sensing and analysis of soils and vegetation resources in the California desert.** L. E. Garvin and R. F. Pascucci (Raytheon Co., Wayland, Mass.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 359-374.

A75-28205 * **Pattern recognition of soils and crops from space.** R. W. Leamer, C. L. Wiegand (U.S. Department of Agriculture, Agricultural Research Service, Weslaco, Tex.), and D. A. Weber. *Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 471-478. 7 refs. NASA Order R-09-038-002.

An evaluation is conducted of the relative effectiveness of the computer analysis techniques which are commonly employed to extract land use (crop identification) information from digitized aerial photographs. It is found that the minimum distance to the mean (MDM) algorithm and the maximum likelihood ratio (MLR) can both be used for the successful recognition of land-use patterns. The MDM algorithm is slightly more accurate in cases involving the use of three or more variables. The use of the MLR algorithm, however, is preferable in cases in which less than three variables are employed. G.R.

A75-28209 **Rock outcrops beneath trees.** B. J. Myers (Forestry and Timber Bureau, Canberra, Australia). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 515-517, 519-521. 7 refs.

Large-scale 70-mm color aerial photographs were used to detect and map the occurrence of weathered granite under a moderately dense eucalypt canopy. Eight combinations of film, illumination and scale were studied. The best results were obtained on color film under cloud at 1:4000 scale. The main limiting factors were dense vegetation and shadow. (Author)

N75-16036*# Agricultural Research Service, Weslaco, Tex.
A STUDY OF THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY/DISTRIBUTION OF HOST PLANTS Progress Report, Aug. 1974
William G. Hart, Principal Investigator, Sammy J. Ingle, and M. R. Davis 31 Aug. 1974 2 p EREP
(NASA Order T-4109-B)
(E75-10115; NASA-CR-141950; PR-19) Avail: NTIS HC $3.25 CSCL 06C

N75-16037*# Agricultural Research Service, Weslaco, Tex.
A STUDY OF THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY/DISTRIBUTION OF HOST PLANTS Progress Report, Jul. 1974
William G. Hart, Principal Investigator, Sammy J. Ingle, and M. R. Davis 31 Jul. 1974 2 p EREP
(NASA Order T-4109-B)
(E75-10116; NASA-CR-141951; PR-18) Avail: NTIS HC $3.25 CSCL 06C

N75-16041*# Bureau of Land Management, Denver, Colo.
PREDICT EPHEMERAL AND PERENNIAL RANGE QUANTITY AND QUALITY DURING NORMAL GRAZING SEASON Final Report, 1 Jul. 1972 - 30 Jun. 1973
R. Gordon Bentley, Jr., Principal Investigator 31 Mar. 1974 87 p refs Original contains color illustrations. Orginal contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10120; NASA-CR-141955) Avail: NTIS HC $4.75 CSCL 08F

The author has identified the following significant results. Collection and update of resource inventory data has historically been a difficult, time consuming task. Accurate resource data is necessary as a basis for wise management decisions made by a resource management agency such as the Bureau of Land Management. Black and white and color infrared composites of ERTS satellite imagery at 1:1,000,000 and enlarged scales can be used as data gathering tools. No investment in expensive sophisticated equipment is necessary. A photointerpreter can map boundaries of soils, plant communities, levels of forage production, areas revegetated by man, and areas burned by wildlife directly from satellite imagery. The ERTS system of producing and distributing imagery must be improved greatly before satellite imagery can be useful to the resource manager.

N75-16042*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Forestry and Timber Bureau.
A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA
N. H. Fisher, Principal Investigator 29 Jan. 1975 1 p Sponsored by NASA EREP
(E75-10121; NASA-CR-141975) Avail: NTIS HC $3.25 CSCL 05B

N75-16049*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Nov. 1974 - 15 Jan. 1975
Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 21 Jan. 1975 10 p EREP
(NASA Order T-4106-B)
(E75-10128; NASA-CR-141999; BMPR-15) Avail: NTIS HC $3.25 CSCL 02F

N75-16067*# Bethune-Cookman Coll., Daytona Beach, Fla.
REMOTE SENSING BY ERTS SATELLITE OF VEGETATIONAL RESOURCES BELIEVED TO BE UNDER POSSIBLE THREAT OF ENVIRONMENTAL STRESS Annual Report
Premsukh Poonai, Walter J. Floyd, and Royce Hall [1974] 23 p refs Original contains color illustrations
(Grant NGR-10-022-001)
(NASA-CR-142008) Avail: NTIS HC $3.25 CSCL 08F

The distribution of natural vegetation types on North Merritt Island, Florida, was studied by analysis of ERTS multispectral scanner data on the image-100 computer system. The boundaries of six distinct plant associations were located on photos made on the image analyzer, with an insignificant mean error of -24.38 meters. The six plant associations are described; each had a characteristic spectral signature. The difference in average reflectance grey level between the lowest of the four spectral scanning bands and the highest spectral scanning band for the six vegetation types was determined. The decreasing trend of the differences is strongly negatively correlated with height of land. Author

N75-16933 Joint Publications Research Service, Arlington, Va.
AGROCLIMATIC ESTIMATE OF THE SUGAR BEET PRODUCTIVITY
L. S. Kelchevskaya *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 99-109 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 81-88

N75-16950*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SOIL MOISTURE DETECTION BY SKYLAB'S MICROWAVE SENSORS Advance Report of Significant Results
R. K. Moore, Fawwaz T. Ulaby, Principal Investigators, John Barr, and Arun Sobti Oct. 1974 6 p refs EREP
(Contract NAS9-13331)
(E75-10131; NASA-CR-142051) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Terrain microwave backscatter and emission response to soil moisture variations were investigated using Skylab's 13.9 GHz RADSCAT (radiometer/scatterometer) system. Data acquired on June 5, 1973, over a test site in west-central Texas indicated a fair degree of correlation with composite rainfall. The scan made was cross-track contiguous (CTC) with a pitch of 29.4 deg and no roll effect. Vertical polarization was employed with both radiometer and scatterometer. The composite rainfall was computed according to the flood prediction technique using rainfall data supplied by weather reporting stations.

N75-16953*# Naticnal Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 30 Jun. 1974 - 30 Jan. 1975
K. J. Savastano, Principal Investigator 10 Feb. 1975 5 p EREP
(NASA Order T-8217-B)
(E75-10134; NASA-CR-142054; MPR-14) Avail: NTIS HC $3.25 CSCL 08A

N75-16954*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Jan. 1975
David S. Gilmer, Principal Investigator Jan. 1975 3 p EREP
(NASA Order T-4114-B)
(E75-10135; NASA-CR-142055) Avail: NTIS HC $3.25 CSCL 06C

N75-16958*# Lockheed Electronics Co., Houston, Tex.
MULTISPECTRAL SCANNER DATA PROCESSING OVER SAM HOUSTON NATIONAL FOREST Progress Report
C. A. Reeves and E. P. Kan Dec. 1974 15 p refs
(Contract NAS9-12200)
(NASA-CR-141610; LEC-5265) Avail: NTIS HC $3.25 CSCL 02F

The Edit 9 forest scene, a computer processing technique, and its capability to map timber types in the Sam Houston National Forest, are evaluated. Special efforts were made to evaluate existing computer processing techniques in mapping timber types using ERTS-1 and aircraft data, and to provide an opportunity to open up new research and development areas in forestry data. Author

N75-17751# California Univ., Los Angeles. Atmospheric Optics and Radiation Lab.
EVALUATION OF INDEX PROPERTIES OF NATURAL FORMATIONS BY POLARIMETRIC STUDIES Final Report, 1 Aug. 1973 - 30 Jun. 1974
Nagaraja C. R. Rao Sep. 1974 51 p refs
(Contract DAAC04-74-G-0011)
(AD-A000901; ARO-11598.2-EN) Avail: NTIS CSCL 08/13

The dependence of the polarization of radiation reflected by surfaces composed of naturally occurring soils on index properties such as moisture (water) content, texture and composition of the soil sample has been examined in detail in the laboratory in selected spectral intervals over the visible and near infrared regions of the spectrum. It is found the polarization of the reflected radiation increases with increasing surface roughness and moisture content. The onset of water-material behaviour occurs at different levels of water content for different samples. Reflection of radiation is governed by the Umow law which establishes the reciprocal relationship between surface brightness and the polarization of reflected radiation. These findings will be the basis for a series of field experiments designed to evaluate the feasibility of detection and estimation of changes in the index properties--primarily the moisture content--of the underlying surface from photopolarimetry of the radiation diffusely reflected into space by the atmosphere-ground system. GRA

N75-17752 British Library Lending Div., Boston Spa (England).
KEY TO EARTH SECRETS
I. Morokhov 26 Jun. 1974 3 p Transl. into ENGLISH from Sots. Ind. (USSR), 4 Jun. 1974
(BLL-M-23603-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of a high-power pulsed MHD-generator for vertical probing of the Earth's crust to depths of 30 to 40 kilometers is discussed. The characteristics of the pulsed MHD-generator are described. The MHD-generators provide information on an area up to 100 kilometers in diameter with one pulse. The application of the plasma generator for locating sources of subsurface minerals is proposed. Author

N75-17758*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report
Roger M. Hoffer, Principal Investigator Jan. 1975 3 p EREP
(Contract NAS9-13380)
(E75-10142; NASA-CR-142143) Avail: NTIS HC $3.25 CSCL 08F

N75-17761*# Natural Resources Management Corp., Eureka, Calif.
APPLICATION OF ERTS-1 IMAGERY AND UNDERFLIGHT PHOTOGRAPHY IN THE DETECTION AND MONITORING OF FOREST INSECT INFECTIONS IN THE SIERRA NEVADA MOUNTAINS OF CALIFORNIA Final Report, 21 Jun. 1972 - 31 May 1974
Ralph C. Hall, Principal Investigator, Stephen L. Wert (Earth Satellite Corp., Berkeley, Calif.), and Thomas W. Koerber (Pacific Southwest Forest and Range Experiment Station) 31 May 1974 53 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57298 ERTS
(Contract NAS5-21770)
(E75-10145; NASA-CR-143676; NRM-3) Avail: NTIS HC $4.25 CSCL 02F

The author has identified the following significant results. Analysis of ERTS-1 imagery with underflight aerial photo support including U-2, in the Sierra Nevada Mountains of California, indicates promising possibilities of detecting and monitoring forest insect outbreaks visually with some mechanical support utilizing the VP-8 image analyzer. Visually, it is possible at a scale of 1:1,000,000 to discriminate between large areas of damaged and undamaged forests; timbered and non-timbered areas; pasture land and cultivated fields; desert and riparian vegetation. At a scale of 1:80,000 it is possible to distinguish among three classes of tree mortality; defoliated and undefoliated areas; non-host mixed conifers; and mountain meadows, rock domes, lakes and glaciers. Machine tests showed significant differences in image densities among various bands and mortality areas.

N75-17763*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
EVALUATION OF ERTS-1 DATA FOR INVENTORY OF FOREST AND RANGELAND AND DETECTION OF FOREST STRESS Final Report
Robert C. Heller, Principal Investigator, Robert C. Aldrich, Richard S. Driscoll, Richard E. Francis, and Frederick P. Weber 9 Aug. 1974 276 p refs Prepared in cooperation with Rocky Mountain Forest and Range Experiment Station Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70251-AG)
(E75-10147; NASA-CR-142148; FS-3) Avail: NTIS HC $8.75 CSCL 02F

The author has identified the following significant results. Results of photointerpretation indicated that ERTS is a good

classifier of forest and nonforest lands (90 to 95 percent accurate). Photointerpreters could make this separation as accurately as signature analysis of the computer compatible tapes. Further breakdowns of cover types at each site could not be accurately classified by interpreters (60 percent) or computer analysts (74 percent). Exceptions were water, wet meadow, and coniferous stands. At no time could the large bark beetle infestations (many over 300 meters in size) be detected on ERTS images. The ERTS wavebands are too broad to distinguish the yellow, yellow-red, and red colors of the dying pine foliage from healthy green-yellow foliage. Forest disturbances could be detected on ERTS color composites about 90 percent of the time when compared with six-year-old photo index mosaics. ERTS enlargements (1:125,000 scale, preferably color prints) would be useful to forest managers of large ownerships over 5,000 hectares (12,500 acres) for broad area planning. Black-and-white enlargements can be used effectively as aerial navigation aids for precision aerial photography where maps are old or not available.

N75-17769# Louisiana State Univ., Baton Rouge.
THE TEN NATURAL VEGETATION REGIONS OF LOUISIANA: AN INTERPRETATION UTILIZING IMAGERY FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE
W. Anthony Blanchard 1973 13 p refs
Avail: NTIS HC $3.25

Natural vegetation regions of Louisiana are identified through the use of black and white imagery from the Multispectral Scanners (MSS) of the Earth Resources Technology Satellite (ERTS). Differences in the amount of infrared reflection from the vegetation and the comparison during two seasons, winter and summer, made possible interpretations of the different local plant regimes. Details of the conditions enabling the interpretation of each natural vegetation region are explained. Author

N75-18643 Joint Publications Research Service, Arlington, Va.
BIANNUAL CYCLICITY OF GRAIN CROP HARVESTS

V. M. Pasov *In its* Meteorol. and Hydrol., No. 11, 1974 (JPRS-63948) 24 Jan. 1975 p 81-92 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1974 p 63-71

In the example of the individual regions the synchrony of the behavior of the biannual fluctuations of the precipitation and the harvest of spring wheat is demonstrated. An effort is made to explain some of the peculiarities of the biannual fluctuations in the winter wheat harvest in a number of parts of the country by their dependence on the processes occurring in the atmosphere. Author

N75-18666*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Jan. 1975
Victor I. Myers, Principal Investigator 20 Feb. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10154; NASA-CR-142204) Avail: NTIS HC $3.25 CSCL 08F

N75-18693*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES Semiannual Progress Report, 1 May - 31 Dec. 1974
Robert N. Colwell 31 Dec. 1974 530 p refs
(Grant NGL-05-003-404)
(NASA-CR-142228; SSL-Ser-16-Issue-2) Avail: NTIS HC $12.50 CSCL 08F

Progress and results of an integrated study of California's water resources are discussed. The investigation concerns itself primarily with the usefulness of remote sensing of relation to two categories of problems: (1) water supply; and (2) water demand. Also considered are its applicability to forest management and timber inventory. The cost effectiveness and utility of remote sensors such as the Earth Resources Technology Satellite for water and timber management are presented. A.L.

N75-19785*# Michigan State Univ., East Lansing. Agricultural Experiment Station.
THE USE OF ERTS DATA FOR A MULTIDISCIPLINARY ANALYSIS OF MICHIGAN RESOURCES Final Report
Axel L. Andersen, Principal Investigator, Wayne L. Myers, Gene R. Safir, Delbert L. Mokma, Eugene P. Whiteside, Harold A. Winters, Richard Rieck, William A. Malila, Jane E. Sarno, Thomas W. Wagner et al Nov. 1974 104 p refs Prepared in cooperation with Environmental Research Inst. of Michigan Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21834)
(E75-10161; NASA-CR-142210) Avail: NTIS HC $5.25 CSCL 08F

N75-19787*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Feb. 1975
Craig L. Wiegand, Principal Investigator Feb. 1975 5 p EREP
(NASA Order T-4105-B)
(E75-10163; NASA-CR-142212; MPR-14) Avail: NTIS HC $3.25 CSCL 02C

N75-19798*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Feb. 1975
David S. Gilmer, Principal Investigator Feb. 1975 3 p EREP
(NASA Order T-4114-B)
(E75-10174; NASA-CR-142223) Avail: NTIS HC $3.25 CSCL 06C

N75-19808*# MRC Corp., Baltimore, Md.
AIRBORNE FOREST FIRE RESEARCH
G. Samuel Mattingly [1974] 18 p refs
(Contract NAS1-13047)
(NASA-CR-132630) Avail: NTIS HC $3.25 CSCL 02F

The research relating to airborne fire fighting systems is reviewed to provide NASA/Langley Research Center with current information on the use of aircraft in forest fire operations, and to identify research requirements for future operations. A literature survey, interview of forest fire service personnel, analysis and synthesis of data from research reports and independent conclusions, and recommendations for future NASA-LRC programs are included. Author

N75-19810# Geological Survey, Reston, Va. Office of International Geology.
THE SHAELIAN ZONE REMOTE SENSING SEMINAR/WORKSHOP W. Africa Investigations, Final
Maurice J. Grolier, Raymond W. Fary, Jr., and Stephen J. Gawarecki Mar. 1974 32 p Conf. held in Bamako, Mali, W. Africa, 17-28 Apr. 1973 Sponsored in part by Agency for Intern. Develop., Washington, D. C.
(PB-236657/3; IR-WA-3) Avail: NTIS HC $3.75 CSCL 05I

A 1973 workshop and seminar on remote sensing to be held April 17 to 28th 1973 in Bamako, Mali, is reported. Thirty-five scientists and management personnel from nine countries and nine commissions participated. Subjects were ERTS experiment data acquisition and processing, the EROS program, and

applications of ERTS data in cartography, geology, geography, hydrology, agriculture, and forestry. The report gives critiques by staff and students and a brief account of activities in U.S. and Mali preparatory to conduction of the course. GRA

N75-20783*# Mississippi State Univ., State College. Inst. for Environmental Science.
A STUDY OF THE APPLICATION OF SKYLAB EREP DATA TO AGRICULTURE IN THE MISSISSIPPI DELTA ALLUVIAL PLAINS REGION Semiannual Report, 24 Jul. 1974 - 1 Mar. 1975
C. W. Bouchillon, Principal Investigator 1 Mar. 1975 5 p EREP
(Contract NAS9-13363)
(E75-10180; NASA-CR-142308) Avail: NTIS HC $3.25 CSCL 08H

N75-20784*# Pennsylvania Univ., Philadelphia. Museum Applied Science Center for Archaeology.
DETECTION OF CROP MARK CONTRAST FOR ARCHAEOLOGICAL SURVEYS Quarterly Progress Report
Bruce Bevan, Principal Investigator 8 Apr. 1975 4 p A Landsat-2 Experiment
(Contract NAS5-20792)
(E75-10181; NASA-CR-142309; QPR-1) Avail: NTIS HC $3.25 CSCL 02C

N75-20787*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Feb. 1975
Victor I. Myers, Principal Investigator 20 Mar. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10184; NASA-CR-142312) Avail: NTIS HC $3.25 CSCL 08F

N75-20790*# South Dakota State Univ., Brookings. Remote Sensing Inst.
EFFECTIVE USE OF ERTS MULTISENSOR DATA IN THE NORTHERN GREAT PLAINS Final Report, 12 Jun. 1972 - 26 Jul. 1974
Victor I. Myers, F. C. Westin, M. L. Horton, and J. K. Lewis, Principal Investigators 26 Jul. 1974 128 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21774)
(E75-10187; NASA-CR-142336; SDSU-RSI-74-09) Avail: NTIS HC $5.75 CSCL 05B

The author has identified the following significant results. ERTS imagery was used as a tool in the identification and refinement of soil association areas; to classify land use patterns between crop and fallow fields; to identify corn, soybeans, and oats; and to identify broad generalized range ecosystems. Various data handling techniques were developed and applied to accomplish these tasks. A map outlining soil associations and relative land values was completed on a base mosaic of ERTS imagery and is included as an appendix to the report.

N75-20791*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF ERTS-1 FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Final Report, 15 Jul. 1972 - 30 Apr. 1974
David S. Gilmer, Principal Investigator, Edgar A. Work, Jr. (Environ. Res. Inst. of Mich.), and A. T. Klett 1 Dec. 1974 101 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10188; NASA-CR-142337) Avail: NTIS HC $5.25 CSCL 06H

The author has identified the following significant results. Information on numbers, distribution, and quality of wetlands in the breeding range of migratory waterfowl is important for the management of this wildlife resource. Using computer processing of data gathered by the ERTS-1 multispectral scanner, techniques for obtaining indices of annual waterfowl recruitment, and habitat quality are examined. As a primary task, thematic maps and statistics relating to open surface water were produced. Discrimination of water was based upon water's low apparent radiance in a single, near-infrared waveband. An advanced technique using multispectral information for discerning open water at a level of detail finer than the virtual resolution of the data was also successfully tested. In another related task, vegetation indicators were used for detecting conditions of latent or occluded water and upland habitat characteristics.

N75-20795*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Mar. 1975
David S. Gilmer, Principal Investigator Mar. 1975 7 p EREP
(NASA Order T-4114-B)
(E75-10192; NASA-CR-142341) Avail: NTIS HC $3.25 CSCL 08H

N75-20796*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-1 DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Final Report, May 1972 - Sep. 1974
Charles W. Welby, Principal Investigator, J. O. Lammi, and Robert J. Carson, III 1 Oct. 1974 171 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21732)
(E75-10193; NASA-CR-142342) Avail: NTIS HC $6.25 CSCL 08F

The author has identified the following significant results. ERTS-1 imagery has been evaluated for use in resource planning and management in North Carolina, and found to be useful for general reconnaissance purposes in forestry, geology, and water resources work. It has also been used for studying large-scale transient phenomena such as river plumes and movement of sediment in the sounds. ERTS-1 imagery has been an aid to geologic and land-use mapping. Stereoscopes, projectors of various kinds, and microscopes have proved useful instruments for the kinds of data acquisition needed by resource planners and managers.

N75-20799*# Texas A&M Univ., College Station. Remote Sensing Center.
[REMOTE SENSING APPLIED TO CROP DISEASE CONTROL, URBAN PLANNING, AND MONITORING AQUATIC PLANTS, OIL SPILLS, RANGELANDS, AND SOIL MOISTURE] Program Summary Progress Report, 1 Aug. 1974 - 1 Feb. 1975
1 Feb. 1975 70 p
(Grant NGL-44-001-001)
(NASA-CR-142558; RSC-08) Avail: NTIS HC $4.25 CSCL 14B

The application of remote sensing techniques to land management, urban planning, agriculture, oceanography, and environmental monitoring is discussed. The results of various projects are presented along with cost effective considerations.
J.M.S.

02

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A75-20356 **Traveling planetary scale waves in the ionosphere.** D. J. Cavalier and R. J. Deland (New York, Polytechnic Institute, Brooklyn, N.Y.). *Journal of Atmospheric and Terrestrial Physics,* vol. 37, Feb. 1975, p. 297-309. 13 refs. NSF Grant No. GA-40848.

From an analysis of long distance received daytime vlf phase data over three transmission paths spanning a total of 160 deg of longitude, and from lower stratospheric radiance data from the SIRS instrument on the Nimbus IV weather satellite, traveling planetary scale waves are shown to exist at about 70 km for the 1970/1971 winter. The vlf phase data are further used in a comparative study of the major midwinter warming which occurred during this period, thereby demonstrating the usefulness of vlf transmissions for studying major midwinter circulation changes. (Author)

A75-21204 # **'Invisible' cirrus clouds in NOAA-2 VHRR imagery.** P. K. Rao (NOAA, National Environmental Satellite Service, Washington, D.C.). *Monthly Weather Review,* vol. 103, Jan. 1975, p. 72-77. 5 refs.

Examples of NOAA-2 VHRR visible and infrared images presented in this paper show the importance and usefulness of these images, particularly in detecting cirrus clouds, when they are used together. (Author)

A75-22528 # **Acquisition and use of ERTS-1 data in Canada.** E. A. Godby (Department of Energy, Mines and Resources, Ottawa, Canada). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 25-51. 18 refs.

Canada has been receiving, processing and distributing data from the ERTS-1 satellite since the day it began transmitting. After two years of operation, a number of applications have passed the experimental stage and are now entering the quasi-operational stage in which the application will be tested in an operational way but on a limited scale. The applications which presently show promise of returning maximum benefits to Canada are: sea ice surveillance and forecasting, resource mapping in Northern Canada, long-term environmental monitoring of major hydroelectric projects and other works of man, monitoring the water quality of lakes and rivers, and agriculture. A cost-benefit study of remote sensing has been underway in Canada for approximately one year. A report on 'Remote Sensing on Sea Ice', which has now been published, forecasts savings to Arctic shipping of $4 million in 1975 growing up to $100 million by 1990. The second phase of the study on the application of remote sensing to northern mapping is now in progress. (Author)

A75-22538 # **Human settlement patterns in relation to resources of less developed countries.** P. Reining (Catholic University of America; American Association for the Advancement of Science, Washington, D.C.). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 214-238. 25 refs.

The general problems involved in making estimates of an agricultural area's carrying capacity are summarized, and specific difficulties encountered in studying an area in tropical West Africa are pointed out. Most data needed for making carrying capacity estimates for Niger are not available from conventional sources. The imagery from ERTS-1 is useful for this purpose because it provides distortion-free, synoptic coverage; it is repetitive, thus allowing timely coverage in all seasons; and it is less costly than data from other sources. Field studies combined with studies of ERTS-1 imagery of Niger and Upper Volta showed that villages 250 m in diameter can be identified at 1:1,000,000 scale, and cultivations or fields of 10 hectares can be reliably identified in the imagery during the growing season. Satellite imagery can be combined with other data sources to made regional carrying capacity estimates possible for such areas. A.T.S.

A75-22539 # **Demographic inference using ERTS images.** C. Foresti and F. De Mendonça (Instituto de Pesquisas Espaciais, São José dos Campos, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 239-255.

Generally speaking, ERTS images provide a fair resolution in determining urban areas. This fact motivated the Geography Group at INPE to consider the possibility of making demographic inferences in the Brazilian territory using these images. Over 280 urban conglomerates (ranging from small villages to towns of population ca. 200,000) are included in the study. From planimetric measurements of their areas and population density statistics obtained from official sources, a population-vs-area model is constructed. A simple trend line method was used to obtain the probabilistic classes. Urban area and population are classified on coordinate axes and an experimental probability density function for the population is derived for a particular area interval. The potential utility of demographic inference using ERTS imagery is discussed. (Author)

A75-22573 **Laser induced fluorescent decay spectra - A new form of environmental signature.** R. M. Measures, W. R. Houston (Toronto, University, Downsview, Ontario, Canada), and D. G. Stephenson (Defence Research Board, Petawawa, Ontario, Canada). *(Society of Photo-Optical Instrumentation Engineers, Seminar on Impact of Lasers in Spectroscopy, San Diego, Calif., Aug. 19-22, 1974.) Optical Engineering,* vol. 13, Nov.-Dec. 1974, p. 494-501. 12 refs.

Studies made of the temporal behaviour of laser-induced fluorescence as a function of emission wavelength for a variety of materials, such as crude oils, refined petroleum products, fish oils, and rock and mineral samples, lead us to believe that this information represents a new kind of spectral signature. The specificity of this 'fluorescence decay spectrum' appears to be somewhat superior to that associated with the normal fluorescence spectrum. Several examples are presented to illustrate the improved identification capability of this new approach. We believe that a significant improvement to the ground truth evaluation capability of the new form of environmental probe currently under development, called a laser fluoresensor, might result from this advance. (Author)

A75-22623 # **Particles and magnetic field in the outer geomagnetosphere.** A. E. Antonova and V. P. Shabanskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). In: International Symposium on Solar-Terrestrial Physics, São Paulo, Brazil, June 17-22, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 168-179. 24 refs.

Magnetic field behavior relative to the charge distribution in the

outer magnetosphere is considered. The results of Electron-4 and IMP-3 measurements of 200-plus keV electron fluxes are analyzed. Spatial distribution of such fluxes is shown to agree with the assumption of branching of the longitude drift shell of charged particles. The importance of seasonal and diurnal variations of the geomagnetic dipole axis as well as the inclusion of interplanetary magnetic field in determining magnetospheric shape are discussed. Theoretical distribution of magnetic field is compared to the results of the Mead-Fairfield empirical magnetospheric model derived from satellite data. (Author)

A75-22781 **Polar cap optical aurora seen from ISIS-2.** C. D. Anger, W. Sawchuk (Calgary, University, Calgary, Alberta, Canada), and G. G. Shepherd (York University, Toronto, Canada). In: Magnetospheric physics; Proceedings of the Summer Advanced Study Institute, Sheffield, England, August 13-24, 1973. Dordrecht, D. Reidel Publishing Co., 1974, p. 357-366. 18 refs.

The variety of different auroral features observed inside the auroral oval with two photometers on the ISIS-2 satellite are described. The instruments scanned the earth from horizon to horizon at wavelengths of 3914, 5577, and 6300 A, providing a complete mapping of a large part of the auroral zone during one favorable pass. Four categories of polar cap auroras are considered: the midnight poleward-expanded aurora, the sun-aligned 6300 arcs, the sun-aligned 5577 arcs, and diffuse and discrete auroras in the polar cap associated with a major magnetic storm. Discussion of these phenomena centers on their common formative process, possibly some form of discontinuity in magnetospheric convection. F.G.M.

A75-22782 **Remarks on the growth phase of substorms.** L. Rossberg (Max-Planck-Institut für Aeronomie, Lindau über Northeim, West Germany). In: Magnetospheric physics; Proceedings of the Summer Advanced Study Institute, Sheffield, England, August 13-24, 1973. Dordrecht, D. Reidel Publishing Co., 1974, p. 367-376. 13 refs.

A pre-bay poleward expansion of 30-plus keV electron intensities near midnight is shown to be coincident with the maximum phase of a plasma sheet expansion in the predawn sector of the Vela orbit. A study of simultaneous particle observations by ATS 1 and 5, and of perturbations of the horizontal component of the magnetic field on ground in the auroral zone, shows that one can arrive at two different conclusions about the relevant substorm phase. Based on the results of a multisatellite study it is suggested to supplement the search for growth phase phenomena by a more general consideration of the varying modes of energy release into the auroral zone. (Author)

A75-23144 # **Teledetection of pollution (La télédétection des pollutions).** M. A. Fontanel (Institut Français du Pétrole, des Carburants et Lubrifiants, Rueil-Malmaison, Hauts-de-Seine, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 401-406. In French.

The applicability of teledetection techniques to pollution monitoring is demonstrated for water and air pollution. Water pollution is divided into chemical, thermal, and globally ecological (upsetting biological equilibrium). Air pollution is more aptly detected from satellites because gaseous pollutants have characteristic spectral signatures. Thermal pollution of the oceans and other bodies of water, however, is amply monitored by infrared sensors. S.J.M.

A75-23148 # **Images from balloons and studies of the natural environment (Les images ballons et les études du milieu naturel).** M.-C. Girard (Institut National Agronomique de Paris-Grignon, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 457-462. In French.

An interpretation of photographs from balloons is provided. An objective means of describing countryside units is described. Land units are classified carefully. A correlation of the newly formulated units with small agricultural regions is accomplished. It is concluded that balloon photography lies somewhere between classical aerial photography and satellite photography in terms of precision and integrative capacity. S.J.M.

A75-23150 # **Cartographic communications of data furnished by aerial thermography and multiband photography /in the case of volcanic terrain/ (Communications cartographiques de données fournies par la thermographie et la photographie multibande aéroportées /cas de terrains volcaniques/).** S. Paul (Paris VIII, Université, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 477-488. 38 refs. In French.

The writer raises questions associated with aerial remote sensing and geological mapping. The discussion bears on methods of communication in cartography concerning two topics: surface geothermics and the detailed structural morphology of volcanic apparatuses. The first topic relates to a thermographic remote sensing process, the second to a multispectral photographic remote sensing process. Results are set out and discussed. (Author)

A75-23165 **Optoacoustic detection of low concentrations of hydrogen fluoride, nitric oxide, and carbon dioxide in gases using radiation of pulsed hydrogen fluoride laser.** A. S. Gomeniuk, V. P. Zharov, D. D. Ogurok, E. A. Riabov, O. A. Tumanov, and V. O. Shaidurov (Akademiia Nauk SSSR, Institut Spektroskopii, Moscow, USSR). *(Kvantovaia Elektronika* /Moscow/, vol. 1, Aug. 1974, p. 1805-1811.) *Soviet Journal of Quantum Electronics,* vol. 4, Feb. 1975, p. 1001-1004. 11 refs. Translation.

A75-23196 # **Airborne absorption spectrometry (Spectrométrie d'absorption a bord d'avion).** J.-C. Fontanella, A. Girard, L. Gramont, and N. Louisnard (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *(Committee for Meteorological Effects of Stratospheric Aircraft and Comité d'Etudes sur les Conséquences des Vols Stratosphériques, Symposium sur les Effets de Avions Stratosphériques, Oxford, England, Sept. 24, 25, 1974.) ONERA, TP* no. 1441, 1974. 8 p. 9 refs. In French.

Results of airborne absorption spectrometry experiments concerning primarily NO, NO2 and HNO3, but also bearing on SO2 and HCHO, are reviewed. The data show the variability in concentration of nitrogen oxides and of HNO3 with meteorological conditions and with latitude. Certain discrepancies between previous models and these results are pointed out. S.J.M.

A75-23252 * # **ERTS applications in state land use planning.** P. G. Pincura (Ohio State, Dept. of Economic and Community Development, Columbus, Ohio), C. J. Meier (Ohio State, Dept. of Natural Resources, Columbus, Ohio), G. B. Garrett (Ohio Environmental Protection Agency, Columbus, Ohio), L. Herd (Ohio State, Dept. of Transportation, Columbus, Ohio), G. E. Wukelic, J. G. Stephan, and H. E. Smail (Battelle Columbus Laboratories, Columbus, Ohio). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 11th, Washington, D.C., Feb. 24-26, 1975, Paper 75-311.* 15 p. NASA-supported research.

The progress made and limitations encountered in using ERTS-1 data for resource management in Ohio is surveyed. Photo-opto-electronic techniques were used with special facility equipment and resolution to 10-30 meters was required to determine strip mine features. Lake Erie's sediment patterns were detected along with flooding conditions, large scale vegetative damage caused by toxic air

pollutants was identified, Ohio land use categories were tabulated and thematic map containing forested areas was derived. The experimental findings regarding utility/relevance assessment were ranked in 4 classes for all the applications involved. Preliminary recommendations for operational satellite earth resources survey data requirements are presented and data analysis and product dissemination are proposed to be centralized in conjunction with thermal IR data and an increased resolution. S.D.

A75-23748 Delineation of transportation facilities from ERTS-1 imagery. E. J. Tullos, Jr. (Tennessee, University, Tullahoma, Tenn.; ECON, Inc., Princeton, N.J.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 19-37.

This paper attempts to examine the ability of the Earth Resources Technology Satellite-1 Multispectral Scanner Subsystem to detect transportation facilities. The study area used is centered on metropolitan Knoxville, Tenn. The format of the imagery was restricted to the 9.5-inch (1:1,000,000) products available from NASA. Factors considered were spectral band, product type and format, and season. The following conclusions were reached: road width is the prime factor in recognition. Only four-lane divided highways are consistently identifiable. The MSS 5 positive transparency and the bulk color composite transparency are the best products. Of the four seasons, summer coverage produced the best results. The greatest value of ERTS-1 found in the study is that from the imagery it is possible to monitor highways under construction and their impact on the landscape. (Author)

A75-23751 * Use of ERTS in measurements of water quality in Lake Superior and the Duluth Superior Harbor. P. Bennett and M. Sydor (Minnesota, University, Duluth, Minn.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 85-92. Grants No. NGL-24-005-263; No. DACW37-74-C-0014.

A75-23754 Remote measurement of water colour and its application to water quality surveillance. W. R. McNeil and K. P. B. Thomson (Canada Centre for Inland Waters, Canada). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 117-146. 36 refs.

Traditional shipboard sampling methods for water management and water quality surveillance, on the Great Lakes, are both costly and time consuming. Remote sensing technology as has been applied to the water quality surveillance problem has not to date produced definitive quantitative data that can be equated to intrinsic limnological parameters. The paper examines the physical relationships between the remote measurement and the in situ or intrinsic parameters. The theoretical development defines a model for the volume reflectance, which is amenable for remote measurement. The model is used to investigate the behavior of the spectral response of the volume reflectance as a function of suspended sediment and chlorophyll concentration. Experimental data from two different areas in the Great Lakes show that realistic intrinsic water color parameters pertinent to water quality, can be obtained from the remote measurement. (Author)

A75-23760 * Inherent limitations of monocular techniques for determining smoke plume parameters from aerial photography - An error analysis. R. N. Blais (Old Dominion University, Norfolk, Va.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 235-241. Grant No. NGL-47-003-067.

A75-23761 * Determination of physical parameters of smoke plumes from aerial photographs for input to computer plume models. G. M. Hilton and R. N. Blais (Old Dominion University, Norfolk, Va.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 243-250. Grant No. NGL-47-003-067.

A75-23762 Use of remote sensing to study the dispersion of stack plumes. K. E. Tempelmeyer (Tennessee, University, Tullahoma, Tenn.) and D. Ey. In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 255-272.

Plume dispersion at great distances down wind of a source may vary considerably because local meteorological conditions do not remain constant. ERTS-1 images provide a cheap and convenient way to monitor a plume that is comprised of particles over large distances. By use of an I.S.I. image analyzer and ERTS-1 images from the multi-spectral bands 4 and 5, it was possible to obtain particulate profiles of a plume from a large smelter up to 70 miles downwind. Integration of these profiles gives a total particulate concentration index. This information can be used to estimate (1) the effects of fall-out from the plume and (2) change in plant operation. Clouds in the images are also used to find the height of the plume as it moves downwind. (Author)

A75-23773 * ERTS-1 - Automated land-use mapping in lake watersheds. R. H. Rogers, L. E. Reed (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), and V. E. Smith (Cranbrook Institute of Science, Bloomfield Hills, Mich.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 463-485. 6 refs. Contract No. NAS5-21810.

A75-23775 * Machine-aided analysis of land use - Landform relations from ERTS-1 MSS imagery, Sand Hills Region, Nebraska. S. Sinnock, W. N. Melhorn, and O. L. Montgomery (Purdue University, Lafayette, Ind.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 503-526. 12 refs. Contract No. NAS5-21785; Grant No. NGL-15-005-112.

Machine-aided analysis of ERTS-1 MSS data obtained over the Sand Hills of Nebraska indicates that reasonably accurate soils maps can be produced automatically. An interpretation of spectral class spatial distribution and statistical character allows confident assignment of familiar soil and cover type names to computer classes. Resultant computer classification maps are displayed on a television screen or printer image. Correlation between computer maps and the USDA soils map of the same area is high. Geographic distribution of classes of interest can be accentuated by automatic methods. Percentages of cover type for any classified area also can be obtained. Interpretation of machine maps yields information concerning land use, physiographic, soil, and hydrologic patterns of the region. (Author)

A75-23776 * Machine processing ERTS-1 data in analyzing land use conflicts in the Indianapolis metropolitan area. J. L.

Guernsey, P. W. Mausel (Indiana State University, Terre Haute, Ind.), and R. H. Gilbert (Purdue University, West Lafayette, Ind.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 527-543. 10 refs. Contract No. NAS5-21773.

A75-23777 Selecting appropriate airborne imagery for the discrimination of land and water resources. R. D. Mower (University of Kansas Center for Research, Inc., Lawrence, Kan.; USAF, Avionics Laboratory, Wright-Patterson AFB; Wright State University, Dayton, Ohio). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 545-559. 14 refs. U.S. Geological Survey Contract No. 14-18-0001-12077; Grant No. DAAK02-68-C-0089. Project THEMIS.

A75-23779 * The uses of ERTS-I imagery in the analysis of landscape change. J. B. Rehder (Tennessee, University, Knoxville, Tenn.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 573-586. Contract No. NAS5-21726.

Analysis of ERTS-I imagery to delimit, map, and monitor photomorphic regions of landscape dynamics is illustrated. Satellite observations were made over strip mining areas on the Cumberland Plateau of Tennessee; agricultural regions in Tennessee, Kentucky, and portions of northern Alabama and Mississippi; urban-suburban growth areas in Knoxville; and flooded areas within the Mississippi River floodplain. Production and analysis of maps of these areas made from ERTS imagery and RB-57 high altitude aircraft imagery are described and compared. The difficulties encountered in analyzing landscape change in or near urban areas are enumerated (small area size, extreme density of settlement, high reflectance characteristics), and the significance of the results of this investigation is noted. F.G.M.

A75-23781 Mission design for advanced land resources remote sensing satellites. D. L. Tingey and G. R. Woodcock (Boeing Aerospace Co., Seattle, Wash.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 609-651.

The paper deals with the design of satellite missions for acquiring land-resources data through multispectral imaging. The general system concept considered is the Earth Observation Satellite (EOS), and the user area chosen for illustration is the state of Washington. An examination is made of the amount of information the EOS can provide to resource managers concerned with agriculture, timber and recreational lands, urban areas, and water resources. The problem of obtaining the desired level of coverage in the presence of cloud cover is quantified. The translation of user needs into mission requirements and system characteristics is discussed. The system characteristics, such as imaging geometry, instrument parameters, communications coverage, and launch vehicle weights and performance, are related to orbit characteristics. A.T.S.

A75-23904 * The laser absorption spectrometer - A new remote sensing instrument for atmospheric pollution monitoring. M. S. Shumate (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: International Telemetering Conference, Los Angeles, Calif., October 15-17, 1974, Proceedings. Pittsburgh, Pa., Instrument Society of America, 1974, p. 388-396. 12 refs. Contract No. NAS7-100.

An instrument capable of remotely monitoring trace atmospheric constituents is described. The instrument, called a laser absorption spectrometer, can be operated from an aircraft or spacecraft to measure the concentration of selected gases in three dimensions. This device will be particularly useful for rapid determination of pollutant levels in urban areas. (Author)

A75-23905 Atmospheric monitoring using infrared heterodyne radiometry. B. J. Peyton (Cutler-Hammer, Inc., AIL Div., Melville, N.Y.). In: International Telemetering Conference, Los Angeles, Calif., October 15-17, 1974, Proceedings. Pittsburgh, Pa., Instrument Society of America, 1974, p. 403-413. 13 refs.

The potential of infrared heterodyne radiometers (IHR's) for remote passive monitoring of such atmospheric constituents as SO2, O3, C2H4, and NH3 is discussed. It is shown that the infrared heterodyne receiver provides excellent sensitivity and specificity as compared to conventional infrared detectors, and that it can be tuned to discrete portions of the infrared spectrum by proper selection of the laser local oscillator. For atmospheric monitoring applications, the IHR telescope collects the thermal energy radiating from the earth at a clear spectral window, or a spectral region where the signature lines of the constituent gases at various layers of the atmosphere will be energized by the upwelling thermal radiation. When the vertical temperature distribution of the atmosphere is known, the concentration of the constituent gas can be determined as a function of altitude from the radiance data collected at the IHR, using an iterative technique. V.P.

A75-23906 Remote monitoring of ozone in the troposphere using earth reflected differential absorption. J. L. Guagliardo and D. H. Bundy (U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nev.). In: International Telemetering Conference, Los Angeles, Calif., October 15-17, 1974, Proceedings. Pittsburgh, Pa., Instrument Society of America, 1974, p. 414-421. 14 refs.

A method of remotely monitoring the tropospheric concentration of ozone over wide areas using an earth reflected differential absorption system is proposed and is shown to be specific and accurate for ozone concentrations encountered in most urban areas, even though only two laser wavelengths are employed. It is believed that this method will be an important addition to the EPA's remote monitoring effort. S.J.M.

A75-23955 # Remote measurement of carbon monoxide and methane from an aircraft. H. W. Goldstein, M. H. Bortner, R. N. Grenda (GE Space Sciences Laboratory, King of Prussia, Pa.), and R. Dick (Barringer Research, Ltd., Toronto, Canada). In: International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, 2nd, San Diego, Calif., July 8-10, 1974, Preprints. Boston, American Meteorological Society, 1974, p. 16-18.

The correlation interferometry technique was used to measure the absorption of reflected solar radiation in the 2.35 micron region including part of the first overtone band of CO and part of the nu-1 + nu-2 band of methane. The internal consistency of the results and their favorable comparison with other available values show the correlation interferometer to be suitable for remote CO and CH4 column-density measurements. S.J.M.

A75-23959 * # Comparative measurements of stratospheric particulate content by aircraft and ground-based lidar. W. Viezee, P. B. Russell, and R. D. Hake, Jr. (Stanford Research Institute, Menlo Park, Calif.). In: International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, 2nd, San Diego, Calif., July 8-10, 1974, Preprints. Boston, American Meteorological Society, 1974, p. 39-44. 6 refs. Contract No. NAS2-7261.

The matching method of lidar data analysis is explained, and the

results from two flights studying the stratospheric aerosol using lidar techniques are summarized and interpreted. Support is lent to the matching method of lidar data analysis by the results, but it is not yet apparent that the analysis technique leads to acceptable results on all nights in all seasons. S.J.M.

A75-23960 # **A possible satellite technique to measure particulate emissions from stratospheric aircraft.** M. Griggs (Science Applications, Inc., La Jolla, Calif.). In: International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, 2nd, San Diego, Calif., July 8-10, 1974, Preprints. Boston, American Meteorological Society, 1974, p. 45, 46. 9 refs.

A satellite radiometer design with an accuracy sufficient to monitor the increase of particles in the North Atlantic flight corridor is proposed as a result of a study relating the atmospheric aerosol optical thickness to the radiance measured over water surfaces by the multispectral scanner on the earth resources technology satellite, ERTS-1. The suggested technique would involve observations of radiance through the flight corridor and alongside it, the difference in radiance being due to aircraft particulates, if it is assumed that the tropospheric and ocean surface conditions are the same for both lines of sight. S.J.M.

A75-24151 # **Environmentalism and aeronautics - Infrastructure (Environmentalism und Luftfahrt - Infrastruktur).** L. Prang (Bundeswehr, Führungsakademie, Hamburg, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt, Jahrestagung, 7th, Kiel, West Germany, Sept. 17-19, 1974, Paper 74-111.* 14 p. In German.

The conflict between ecological conservation and technological developments at airports is considered. Various measures taken up to the present to reduce noise and other pollutions near airfields are discussed, and demographic and transportation maps are presented. The conservation-technical progress controversy can be resolved into four camps: those who benefit directly from aerodromes, those who design and build aerodromes, those who suffer from the effects of aerodromes, and nonpartisan (uninvolved) parties. S.J.M.

A75-24671 **Water quality analysis of the Potomac estuary from ERTS-1 data.** H. Kritikos, L. Yorinks (Pennsylvania, University, Philadelphia, Pa.), H. Smith, and N. Melvin (U.S. Environmental Protection Agency, Philadelphia, Pa.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 20, 21.

A75-24674 **Acoustic sounders for predicting air pollution over cities.** J. W. Wescott (NOAA, Wave Propagation Laboratory, Boulder, Colo.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 66, 67.

The acoustic echo remote probing technique and apparatus are explained and described. It is demonstrated that acoustic sounding can be of significant value in predicting the onset and tapering off of alert-level pollution, caused for example by temperature inversion. The use of an acoustically absorbent, anechoic cuff on the horn-reflector antenna reduces sidelobe rejection of the strong tone bursts the 50 to 60 db necessary for application in heavily populated areas. S.J.M.

A75-24677 **Land use inventory of the Great Lakes basin by computer analysis of satellite data.** R. A. Weismiller and M. F. Baumgardner (Purdue University, West Lafayette, Ind.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 112, 113.

An avenue for preparing timely, large-area land use inventories that are relatively inexpensive by utilizing computer-aided analysis of multispectral scanner (MSS) data from the earth resources technology satellite (ERTS-1) is presented. The area covered concerns the Great Lakes watershed. It is classified into land use categories: urban, agriculture, forest, and no major usage, which are further subclassified. S.J.M.

A75-24678 * **Preparation of remotely-sensed image data for land use planning.** A. D. Bond, R. J. Atkinson, M. Lybanon, and H. K. Ramapriyan (Computer Sciences Corp., Huntsville, Ala.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 114, 115. Contract No. NAS8-21805.

Preliminary processing operations required before computer compatible tapes (CCT) can be utilized routinely to realize the full potential of ERTS imagery for rapid mensuration, quantitative estimation and for detecting and monitoring changes over time are described. Geographic referencing, geometric manipulations, classification, and association overlays (as of political boundaries) are discussed. S.J.M.

A75-24679 * **The use of multispectral difference data for urban change detection.** P. E. Anuta (Purdue University, West Lafayette, Ind.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 116, 117. Grant No. NGL-15-005-112; Contract No. NAS5-21773.

The current work describes an experiment in which ERTS-1 digital multispectral scanner data from two times was used to detect change in an urban scene. The computer analysis implementation approach explored here was to register image data from the two times and to subtract the data to form multispectral difference images. The difference imagery was then analyzed using statistical pattern recognition to separate and classify different types of change. Construction was successfully detected. S.J.M.

A75-24680 **Detection, movement and dispersion of turbidity plumes in Lake Ontario.** E. J. Pluhowski (U.S. Geological Survey, Reston, Va.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 170, 171.

A75-24897 # **The urban plume as seen at 80 and 120 km by five different sensors.** R. J. Breeding, P. L. Haagenson, J. A. Anderson (National Center for Atmospheric Research, Boulder, Colo.), J. F. Stampfer, Jr. (Missouri, University, Rolla, Mo.), and J. P. Lodge, Jr. *Journal of Applied Meteorology,* vol. 14, Mar. 1975, p. 204-216. 14 refs.

The records from pollutant sensors aboard two aircraft are compared. The aircraft flew along arcs of either 80 or 120 km radius from the Gateway Arch in St. Louis. One aircraft contained a light-scattering instrument which determined the concentrations of particles with radii between 0.15 and 0.30 microns and between 0.30 and 1.3 microns. The other airplane contained an integrating nephelometer, a condensation nucleus counter, and an ozone monitor. It appears that neither the concentration of the condensation nuclei nor the ozone concentration are as reliable indicators of the location of the St. Louis plume at these distances as are data from the light-scattering particle counter or the nephelometer. (Author)

A75-26603 **Vertical distribution of NO, NO2, and HNO3 as derived from stratospheric absorption infrared spectra.** J.-C. Fontanella, A. Girard, L. Gramont, and N. Louisnard (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *Applied Optics,* vol. 14, Apr. 1975, p. 825-839. 20 refs. Research supported by the Comité d'Etudes des Conséquences des Vols Stratosphériques.

Infrared absorption data on NOx and HNO3 concentrations in the low stratosphere obtained on Concorde 001 during summer 1973. The data are in agreement with previous balloon spectrophotometry. The high-resolution (to 0.1 wavenumbers) grille spectrometer was used, and methods of data treatment are described. Nitric acid was found to be more predominant between 15 and 20 km than had been expected. Future studies are planned. S.J.M.

A75-26848 **Towards a European freshwater satellite.** J. Tinker. *New Scientist,* vol. 65, Mar. 27, 1975, p. 768-771.

Infrared satellite data of European waters are qualitatively discussed, and political aspects of the pollution problem are pointed out. It is shown that certain coastal waters are isolated from their adjacent ocean by lack of circulation, and that these areas pose a particular danger to industry. The Kaminski plan for integral river basin management using satellite coordination is considered, and some of its practical shortcomings are indicated. S.J.M.

A75-27249 * **Detection of fluorocarbons in the stratosphere.** D. G. Murcray, J. N. Brooks, F. H. Murcray, W. J. Williams (Denver, University, Denver, Colo.), F. S. Bonomo (Denver University; Denver Research Institute, Denver, Colo.), and A. Goldman. *Geophysical Research Letters,* vol. 2, Mar. 1975, p. 109-112. 6 refs. NASA-NSF-USAF-supported research.

Infrared absorption spectral measurements are applied to selected balloon flight data to detect CF2Cl2 and CFCl3 in the stratosphere. Identification of the fluorocarbons from absorption spectra is described, and the results are compared with previous models of fluorocarbon content at 21 km. A volume mixing ratio is derived for CF2Cl3 and a probable ratio is estimated for CFCl3. An upper limit for HF in the lower stratosphere up to 30 km is set based on data from a balloon flight. F.G.M.

A75-27251 **Satellite observation of cloud patterns over East Australian current anticyclonic eddies.** P. Scully-Power (Royal Australian Navy, Research Laboratory Garden Island, New South Wales, Australia) and P. Twitchell (U.S. Navy, Office of Naval Research, Boston, Mass.). *Geophysical Research Letters,* vol. 2, Mar. 1975, p. 117-119. 14 refs. Contract No. N00014-75-WR-50209.

A75-27327 # **Application of ERTS-1 pre-enhanced imagery for arid land recreation planning.** C. F. Hutchinson and J. R. Huning (California, University, Riverside, Calif.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 1-9. 7 refs.

Preliminary findings of a study on the feasibility of using ERTS-1 imagery for mapping significant textural composition and textural boundaries of desert surfaces and slopes are reported. The technique of silver marking of ERTS-1 imagery was shown to be an effective method. In this way, data can be provided to agencies concerned with the use of the desert for recreational activities such as motorcycle racing, showing which areas will be more compatible to the activity. P.T.H.

A75-27328 # **Urban land use mapping in southern Arizona - *The Tucson example.*** V. A. Milazzo (U.S. Geological Survey, Washington, D.C.), K. E. Foster, and L. J. Gibson (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 10-31. 6 refs.

The present work summarizes the main findings of a study of land use changes over the period 1970 to 1972 in Tucson, for which data were acquired in 1970 in the form of multispectral, high-altitude aerial photography, and in 1972 in the form of multispectral ERTS underflight photography. Tables and photographs are given showing inventory of 1970 land use, field editing of 1970 land use manuscripts, detection and measurement of land use changes, mapping of 1970 statistical areas, and evaluation of ERTS imagery of the Tucson area. P.T.H.

A75-27329 # **Imaging passive microwave as a data source for arid environments.** R. R. Thaman, L. W. Senger (California, University, Santa Barbara, Calif.), and J. O. Hooper (U.S. Naval Weapons Center, China Lake, Calif.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 32-56.

The present work describes the development and capabilities of microwave radiometry as it applies to the remote sensing of arid land environments. A general discussion of the physical and practical characteristics of microwave radiometry is given. Preliminary results of an experiment to evaluate the usefulness of microwave radiometric data for the detection and identification of urban and rural terrain features in the arid West Side of the San Joaquin Valley, California, are evaluated. P.T.H.

A75-27331 * # **ADP pattern recognition of urban land uses from satellite-borne multispectral scanner.** R. Ellefsen (California State University, San Jose, Calif.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 71-81. 6 refs. Research supported by the U.S. Department of the Interior and NASA.

A75-27333 # **SLAR for mapping urban land use, desert soil and vegetation, and emergency landing sites.** L. K. Lepley (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, *Proceedings.* Tucson, University of Arizona, 1974, p. 97-106.

The present work describes briefly some results of studies which tested the feasibility of side-looking airborne radar (SLAR) for the mapping of land use, geologic hazards, natural desert vegetation, and aeronautical safety factors. Urban structures and other cultural features are extremely visible on small scale SLAR. Certain land use categories can be extracted from this imagery with much less effort than from high altitude photographic imagery due to the high contrast inherent in SLAR imagery. Xerophytic vegetation is more easily mapped from SLAR than from small-scale aerial photographs. Smooth, brush-free areas suitable for emergency landing of light aircraft are easily delineated with SLAR. Although no strong relation between these vegetation-free areas and flooding hazards was obvious, the physiographic borders between the alluvial valley floor and the slopes of the bajadas are very discernable on SLAR. P.T.H.

A75-27334 * # **Application of machine-processed ERTS-1 data to regional land use inventories in arid western Colorado.** W. N. Melhorn, S. Sinnock, and R. P. Mroczynski (Purdue University, Lafayette, Ind.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 107-124. 8 refs. Contract No. NAS5-21880.

A75-27338 # **Sand dunes in desert areas.** C. S. Breed (U.S. Geological Survey, Flagstaff, Ariz.) and E. C. McKee (U.S. Geological Survey, Denver, Colo.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 160-171. 25 refs.

Synoptic, global coverage by ERTS-1 imagery at a constant and uniform scale of 1:1,000,000 makes possible the quantitative measurement and comparison, on a worldwide basis, of major sand sea characteristics. Windblown sand accumulations in the deserts of Africa, Asia, Australia, and the western United States are easily

recognized on ERTS-1 imagery by their high reflectivity, generally yellow hue, and characteristic dune-field patterns. The relation of dune pattern types and distribution to variations in wind regimes, sand supplies, physical barriers, rainfall, and vegetation is under study. The goal is to determine relationships between the measured characteristics of modern sand seas and the geologic analysis of paleoenvironments and structures of ancient eolian sandstones, which may then be applied to the analysis of regional sandstone aquifers and petroleum reservoirs. (Author)

A75-28115 # **Rocket measurements of water vapour in the stratosphere.** W. F. J. Evans (Atmospheric Environment Service, Toronto, Canada). In: International Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, Australia, January 14-25, 1974, Proceedings. Volume 1. Downsview, Ontario, Canada, International Association of Meteorology and Atmospheric Physics, 1974, p. 249-256. 13 refs.

A new technique for the measurement of water vapor in the stratosphere from long-path length solar absorption has been developed. Preliminary analysis of the data from the first rocket flight at Churchill in May, 1973 has produced a profile of the water vapor mixing ratio up to 50 km. The measured mixing ratio was 3.5 ppmv from 10 to 30 km and increased to greater than 5 ppmv at 45 km. The high mixing ratio at 45 km is consistent with the photochemical conversion of CH4 to H2O. (Author)

A75-28121 # **Meso-scale variations in atmospheric water vapor in tropical regions deduced from VTPR measurements.** D. Q. Wark (NOAA, National Environmental Satellite Service, Washington, D.C.). In: International Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, Australia, January 14-25, 1974, Proceedings. Volume 1. Downsview, Ontario, Canada, International Association of Meteorology and Atmospheric Physics, 1974, p. 315-320.

The Vertical Temperature Profile Radiometer (VTPR) on the NOAA-2 satellite measures the earth's radiance at 19 microns, where emission by the atmosphere arises from water vapor. In low-latitude regions the mean level from which the emitted radiation comes is between about 850 mb and 600 mb for very dry and very moist atmospheres, respectively. Measurements in the Tropics are combined with other VTPR measurements to deduce the total precipitable water in areas 73 x 81 sq km and 520 x 580 sq km. It is shown that in both resolution scales there is a large variability in water vapor content of otherwise similar areas. Horizontal variability of precipitable water is guided by the large-scale circulation patterns for the coarser resolution. Random variations of 7 percent are found at the finest resolution; these are attributed to local convection cells which occur even in clear areas. (Author)

A75-28128 # **The distribution of tropospheric ozone from worldwide surface and aircraft observations.** P. G. Pruchniewicz, H. Tiefenau, P. Fabian, P. Wilbrandt, and W. Jessen (Max-Planck-Institut für Aeronomie, Lindau über Northeim, West Germany). In: International Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, Australia, January 14-25, 1974, Proceedings. Volume 1. Downsview, Ontario, Canada, International Association of Meteorology and Atmospheric Physics, 1974, p. 439-451. 20 refs. Research supported by the Deutsche Forschungsgemeinschaft and Max-Planck-Institut für Chemie.

A75-28132 # **The use of BUV satellite observations to study ozone depletion processes.** A. D. Christie (Atmospheric Environment Service, Toronto, Canada). In: International Conference on Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, Australia, January 14-25, 1974, Proceedings. Volume 1. Downsview, Ontario, Canada, International Association of Meteorology and Atmospheric Physics, 1974, p. 494-508. 34 refs.

Variations in the global distribution of atmospheric ozone, over a period during which a small megaton nuclear weapon was detonated in tropical latitudes, have been studied using consistent observations from instrumentation on the Nimbus 3 satellite. Little change in ozone is observed, and the results are used to speculate on the importance of SST generated nitrogen oxides on ozone depletion. (Author)

A75-28208 **Coastal zone classification from satellite imagery.** V. Klemas, D. Bartlett (Delaware, University, Newark, Del.), and R. Rogers (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 499-507, 509-513.

Imagery and digital tapes from nine ERTS-1 passes and one successful Skylab pass over the Delaware Bay test site were analyzed in connection with the reported investigation. Ten vegetation and land-use categories were selected as offering the most useful information while being readily identifiable in high altitude imagery. Using a man-assisted, automated approach, it was possible to classify correctly all categories tested more than 80% of the time. The results indicate that both ERTS and Skylab can be used to inventory significant cover types on a regional basis. G.R.

A75-28587 **Laser polar nephelometer for airborne measurements of aerosol optical properties.** G. W. Grams, A. J. Dascher, and C. M. Wyman (National Center for Atmospheric Research, Boulder, Colo.). *Optical Engineering,* vol. 14, Jan.-Feb. 1975, p. 85-90. 32 refs.

A nephelometer is developed for airborne measurements of polar scattering diagrams of atmospheric aerosols on a pressurized aircraft throughout the troposphere and lower regions of the stratosphere. The instrument is flown on the NASA Convair 990 airborne laboratory to obtain data on the complex index of refraction of atmospheric aeorosols. Particle sizing devices are used simultaneously to determine the aeorosol size-number distribution. It is found that the most probable value of the complex refractive index is the one which provides the best fit between the experimental light-scattering data and the polar scattering diagrams calculated from the observed size distribution function. S.D.

A75-28698 # **Measurement of lower atmospheric temperature profiles from ground-based infrared observations.** J. Y. Wang, C. R. Claysmith (General Dynamics Corp., Corvair Aerospace Div., San Diego, Calif.), and M. Griggs (Science Applications, Inc., La Jolla, Calif.). *Journal of Applied Meteorology,* vol. 14, Apr. 1975, p. 308-318. 7 refs. Research supported by the General Dynamics Corp; Contract No. N00014-72-C-0175.

A ground-based infrared spectroradiometer has been used to measure the vertical temperature profile of the lower atmosphere from 0 to 6 km. Eight measurements in the 15-micron carbon-dioxide band have been used for the inversion in addition to three measurements in the 18-micron water-vapor band for the water-vapor corrections. One additional observation in the 11-micron window region is used to determine the presence of cloud. Twenty-one sets of clear-sky data obtained in the summer of 1971 are used to verify the inversion technique. The resultant profiles have an accuracy comparable to that of radiosondes with an overall rms error of 1.58 C. (Author)

A75-28756 **Measurements of Pc 5 ionospheric electric fields by means of balloon-borne sensors.** N. D'Angelo, I. B. Iversen, and M. M. Madsen (Danish Space Research Institute, Lyngby, Denmark). *Journal of Geophysical Research,* vol. 80, Apr. 1, 1975,

p. 1352, 1353. 8 refs. Research supported by the Norwegian Council for Scientific and Technical Research.

N75-15770# Southwest Research Inst., San Antonio, Tex.
COLLABORATIVE STUDY OF METHOD FOR STACK GAS ANALYSIS AND DETERMINATION OF MOISTURE FRACTION WITH USE OF METHOD 5 Environmental Monitoring Series
Henry F. Hamil and Richard E. Thomas Jun. 1974 40 p refs (Contract EPA-68-02-0626)
(PB-236929/6; EPA-650/4-73-026) Avail: NTIS HC $3.75 CSCL 14B

Statistical analyses are performed on data from EPA method 3 and from the stack gas moisture fraction determination obtained in the collaborative testing of EPA method 5 (particulates). For method 3, the precision of CO2 and O2 determination using an Orsat analyzer is investigated, as well as the effect of this on the dry molecular weight and excess air calculations. The effect of variability in CO2 and O2 determinations on correcting particulate determinations to a common base is studied. The precision of the determination of the moisture fraction of the stack gas by the formula in method 5 is studied. Recommendations are made for the improvement of the precision of the Orsat method. GRA

N75-16032*# Environmental Research Inst. of Michigan, Ann Arbor.
OIL POLLUTION DETECTION, MONITORING AND LAW ENFORCEMENT Quarterly Progress Report, Nov. 1974
Robert Horvath, Principal Investigator 22 Jan. 1975 2 p EREP
(Contract NAS9-13281)
(E75-10111; NASA-CR-140922; ERIM-101800-17-P) Avail: NTIS HC $3.25 CSCL 13B

N75-16038*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Dec. 1974
Irvin J. Sattinger, Principal Investigator 21 Jan. 1975 2 p EREP
(Contract NAS9-13283)
(E75-10117; NASA-CR-141952; ERIM-103300-42-L) Avail: NTIS HC $3.25 CSCL 08B

N75-16044*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Progress Report, 1 Apr. 1974 - 31 Jan. 1975
Charles E. Poulton, Principal Investigator 31 Jan. 1975 3 p EREP
(Contract NAS9-13286)
(E75-10123; NASA-CR-141977) Avail: NTIS HC $3.25 CSCL 08B

N75-16046*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Div. of Land Use Research.
A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDY IN AUSTRALIA
N. H. Fisher, Principal Investigator [1975] 1 p Sponsored by NASA EREP
(E75-10125; NASA-CR-141957) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Cursory examination shows that the Skylab photos alone would provide all the pictorial information needed for surveys in arid and semiarid regions according to the pattern of the Alice Springs survey (mapping at a scale of 1:1 million).

N75-16069*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A PROCEDURE FOR AUTOMATED LAND USE MAPPING USING REMOTELY SENSED MULTISPECTRAL SCANNER DATA
Sidney L. Whitley Washington Jan. 1975 49 p refs Original contains color illustrations
(NASA-TR-R-434; JSC-S-406) Avail: NTIS HC $3.75 CSCL 08B

A system of processing remotely sensed multispectral scanner data by computer programs to produce color-coded land use maps for large areas is described. The procedure is explained, the software and the hardware are described, and an analogous example of the procedure is presented. Detailed descriptions of the multispectral scanners currently in use are provided together with a summary of the background of current land use mapping techniques. The data analysis system used in the procedure and the pattern recognition software used are functionally described. Current efforts by the NASA Earth Resources Laboratory to evaluate operationally a less complex and less costly system are discussed in a separate section. Author

N75-16158# Research Triangle Inst., Durham, N.C.
INVESTIGATION OF OZONE AND OZONE PRECURSOR CONCENTRATIONS AT NONURBAN LOCATIONS IN THE EASTERN UNITED STATES *Final Report*
E. L. Martinez and Elbert C. Tabor May 1974 236 p refs (Contracts EPA-68-02-1077; EPA-68-02-1343)
(PB-236931/2; EPA-450/3-74-034) Avail: NTIS HC $7.50 CSCL 13B

The monitoring of ozone and ozone precursors in nonurban areas is reported. The first section presents results of an air quality measurement program for ozone, nitrogen dioxide, and nonmethane hydrocarbons. Monitoring station design, equipment, calibration, and operation are discussed. A quality assurance program describes the procedures employed and the results obtained in an evaluation of the interrelatability of ozone and ozone precursor measurements. Finally an airborne ozone concentration measurement is described. An instrumented C-45 aircraft was employed in an effort to relate surface and lower tropospheric air quality. (Modified author abstract) GRA

N75-16163# National Environmental Research Center, Grosse Ile, Mich. Grosse Ile Lab.
THE EPA IFYGL PROJECTS Annual Report
Dec. 1973 351 p refs
(PB-235947/9; EPA-660/3-73-021; W74-12214; AR-1) Avail: NTIS HC $10.00 CSCL 13B

The field data collection phase of an intensive multidisciplinary study of Lake Ontario was conducted in 1972-73 by agencies of the United States and Canada. The scientific program was designed to further the basic scientific knowledge of the Great Lakes, to provide the basis for improved water quality and quantity management, and to comprehend the broad impact of the lake on the environment of the Great Lakes Basin. The Chemistry-Biology Program had three major objectives-material balance studies, evaluation of the current ecologic status of the lake, and the development of predictive mathematical models. GRA

N75-16945 British Library Lending Div., Boston Spa (England).
THE HEALTH OF THE PLANET
L. Yefremov [1974] 5 p Transl. into ENGLISH from the Russian
(BLL-M-23519-(5828.4F)) Avail: British Library Lending Div. Boston Spa, Engl.: 1 BLL photocopy coupon

The protection of the environment and the rational utilization of natural resources are discussed for the Soviet Union. The prevention of water and air pollution, and protective measures for the prevention of soil erosion are also discussed. F.O.S.

N75-16952*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, Nov. 1974 - Jan. 1975

David T. Chang, Principal Investigator Jan. 1975 2 p EREP
(Contract NAS9-13343)
(E75-10133; NASA-CR-142053; QPR-7) Avail: NTIS HC $3.25 CSCL 04A

N75-17010 British Library Lending Div., Boston Spa (England).
BIOSPHERIC POLLUTION CONTROL, ECONOMIC AND SOCIAL ASPECT
B. Maklyarski 1974 16 p refs Transl. into ENGLISH from Miro Ekon. Mezhdunarodnyie Otnosehniya (USSR), no. 5, 1974 (BLL-M-23595-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

An analysis of the problems of environmental pollution and the effects on the biosphere is presented. It is stated that a means must be developed to enable effective use to be made of scientific and technological achievements to meet the essential material requirements of society without adversely affecting the ecological balance. The authors recommend that action be taken to maintain the present level of population and prevent additional population expansion. Various forecasts which analyze the state of natural resources, nonrenewable resources, and the industrial impact are examined. Specific methods for improving the quality of the water and the air are recommended. Author

N75-17208* Rice Center for Community Design and Research, Houston, Tex.
THE APPLICATION OF NATURAL SCIENCE DATA TO LAND MANAGEMENT DECISION-MAKING
Donald L. Williams, Carl P. Sharpe, and Peter G. Rowe *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 219-228 refs

CSCL 08B

A natural environmental analysis process which allows the decision maker to know the probable consequences of a decision prior to the act is developed. Emphasis is placed on the fit between the natural environment and the social, economic, and functional attributes of man's communities and the transition from nature in its present state to various forms and intensities of development. Applications of the analysis are examined. It is concluded that the analysis is a workable system for land use management. J.M.S.

N75-17647# Michigan Dept. of State Highways. Research Lab. Section.
APPLICATION OF INSTRUMENTAL METHODS FOR EVALUATING HIGHWAY MATERIALS (INFRARED SPECTROSCOPIC CHARACTERIZATION OF PAVING ASPHALTS IN RELATION TO DURABILITY) Final Report
W. L. Frederick Jun. 1974 70 p refs
(PB-236653/2; R-751) Avail: NTIS HC $4.25 CSCL 13C

This report presents information obtained during a study aimed at finding correlations between durability of paving asphalts and differences in composition of the asphalts as shown by infrared spectrophotometric data. Six asphalts used in an experimental test road (1954) and ten asphalts representative of those available in Michigan in 1965, were characterized by infrared spectroscopy. The infrared data were correlated with: pavement performance (test road asphalts only), weatherometer exposure (1965 asphalts only), a pellet tumbling test to gage durability as aggregate binders, and the crude oil sources of the asphalts. The general agreement of the infrared data, with the results of the above tests, indicates that infrared spectroscopic methods can be used to help predict the potential durability of an asphalt in pavement. Moreover, it is often possible to identify the crude oil source of an unknown asphalt, provided that infrared reference data are available for asphalts from the same crude oil source. GRA

N75-17754*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert Alexander, Principal Investigator, Robert W. Pease, and Harry F. Lins, Jr. 22 Jan. 1975 7 p EREP
(NASA Order T-5290-B)
(E75-10138; NASA-CR-142104) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. Successful tentative calibration permits computer programs to be written to convert Skylab thermal tapes into line-printed graymaps showing actual surface radiation temperature distributions at the time of imaging. The calibrations will be further checked when atmospheric soundings are available. Success of Skylab calibration suggests that satellite are feasible platforms for thermal scanning and provide a much broader geographical field of view than is possible with airborne platforms.

N75-17778# California Univ., Los Angeles. Dept. of Geography.
REMOTE SENSING OF SUBTROPICAL COASTAL ENVIRONMENTS: NATAL, SOUTH AFRICA
Antony R. Orme and Larry L. Loeher Jul. 1974 95 p refs
(Contract N00014-69-A-0200-4035; NR Proj. 388-102)
(AD-A000280; TR-3) Avail: NTIS CSCL 08/6

Remote sensing of subtropical coastal environments is examined with particular reference to Natal, South Africa. Vertical color infrared (CIR) imagery at a scale of 1:25,000 with 60% forward overlap forms the basis for analysis, supported by similar panchromatic coverage and hand-held oblique panchromatic and CIR imagery. The CIR imagery used in this study contributes significantly to the understanding of the physical, biological, and human components of the Natal coastal environment and, by extension, to environemntal analysis of 2000 km of similar coastline from central Mozambique to eastern Cape Province. (Modified author abstract) GRA

N75-18632 British Library Lending Div., Boston Spa (England).
FORECAST FOR THE PLANET
K. Kondratiev 10 Jan. 1974 4 p Transl. into ENGLISH from Pravda (USSR), 25 Dec. 1973
(BLL-M-23332-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of remote sensing methods to probe different terrestrial phenomena was investigated. Methods involving ground-borne, aircraft, and aerostatic observations are discussed along with methods applying weather satellites, automatic interplanetary probes, manned spacecraft, and orbiting stations. The relation of these remote sensing methods to planning future development of the earth's resources is also discussed. M.J.S.

N75-18664*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Progress Report, 1 Feb. - 28 Feb. 1975
Charles E. Poulton, Principal Investigator 28 Feb. 1975 4 p EREP
(Contract NAS9-13286)
(E75-10152; NASA-CR-142202) Avail: NTIS HC $3.25 CSCL 08B

N75-18696*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SURVEYS OF THE EARTH'S RESOURCES AND ENVIRONMENT BY SATELLITES
William Nordberg, Herb Tiedemann, and Charles Bohn Feb. 1975 20 p refs Submitted for publication
(NASA-TM-X-70843; X-900-75-35) Avail: NTIS HC $3.25 CSCL 08G

The potential and promise of observing the earth from the vantage point of space is discussed. The systematic surveying of processes and phenomena occurring on the surface of the earth by Landsat 1 and Nimbus 5 is considered to be useful in the following areas: assessment of water resources; mineral and petroleum exploration; land use planning; crop, forest, and rangeland inventory; assessment of flood, earthquake, and other environmental hazards; monitoring coastal processes; environmental effects of industrial effluents and of air pollution; mapping

the distribution and types of ice covering the earth's polar caps and global soil moisture distributions. Author

N75-18699*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SLAR IMAGE INTERPRETATION KEYS FOR GEOGRAPHIC ANALYSIS
Jerry C. Coiner Sep. 1972 116 p refs
(Contract NAS9-10261)
(NASA-CR-141638; CRES-TR-177-19) Avail: NTIS HC $5.25 CSCL 08B

A means for side-looking airborne radar (SLAR) imagery to become a more widely used data source in geoscience and agriculture is suggested by providing interpretation keys as an easily implemented interpretation model. Interpretation problems faced by the researcher wishing to employ SLAR are specifically described, and the use of various types of image interpretation keys to overcome these problems is suggested. With examples drawn from agriculture and vegetation mapping, direct and associate dichotomous image interpretation keys are discussed and methods of constructing keys are outlined. Initial testing of the keys, key-based automated decision rules, and the role of the keys in an information system for agriculture are developed. Author

N75-18701# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT SAINT VRAIN NUCLEAR GENERATING STATION, OCTOBER 1971
Aug. 1974 15 p refs Sponsored by ERDA
(ARMS-72.6.9) Avail: NTIS HC $3.25

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Fort St. Vrain Nuclear Generating Station prior to reactor start-up. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma spectral and gross-count data. The data were then computer processed into a map of a 670 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. Author (NSA)

N75-18705# National Research Council, Washington, D.C.
REMOTE SENSING FOR RESOURCE AND ENVIRONMENTAL SURVEYS: A PROGRESS REVIEW, 1974
Aug. 1974 109 p
(PB-237410/6; CORSPERS-74-1) Avail: NTIS HC $5.25 CSCL 08G

A committee report on resource and environmental information extracted from ERTS data is discussed along with problems faced by users of such information. Special attention was given to the following problems: (1) lack of assurance that the program will be continued beyond the technology demonstration phase, and (2) the strength of repetitive synoptic space imagery, with selective spectral range and resolution but with lower spatial resolution, does not readily fit into the information process and decision models currently used by many operational managers. Author

N75-18774# Atomic Energy Commission, New York. Health and Safety Lab.
SECOND WORKSHOP ON THE NATURAL RADIATION ENVIRONMENT
W. M. Lowder, ed. Sep. 1974 168 p refs Workshop held at New York, Feb. 1974
(HASL-287; Conf-740212) Avail: NTIS HC $6.25

In February 1974, a workshop on current studies of the natural radiation environment was held at the AEC Health and Safety Laboratory. Papers were presented on various airborne and ground-based survey techniques and results, and on analytical models related to the time variations of environmental gamma radiation. Discussion centered on longterm measurement programs to determine trends in environmental radionuclide levels and to understand the environmental factors that influence the space and time variations of the natural background radiation. Informal committees were organized to encourage cooperative planning for such programs and the intercomparison of various measurement techniques. Author

N75-18782# Environmental Protection Agency, Corvallis, Oreg. National Ecological Research Lab.
THE BIOENVIRONMENTAL IMPACT OF AIR POLLUTION FROM FOSSIL-FUEL POWER PLANTS Final Report
Aug. 1974 25 p refs
(PB-237720/8; EPA-660/3-74-011) Avail: NTIS HC $3.25 CSCL 13B

The body of information presented is directed to environmental scientists and engineers and to those land managers who will be involved in assessing the effects of energy conversion activities on the environment. A prototype investigation of the bioenvironmental effects of air pollution challenge from coal-conversion facilities is summarized. Objectives, rationale, and the overall design of this research are presented. Recommendations regarding the selection of suitable criteria of environmental damage are also made. GRA

N75-18790# Naval Research Lab., Washington, D.C.
THE DETERMINATION OF OIL SLICK THICKNESS BY MEANS OF MULTIFREQUENCY PASSIVE MICROWAVE TECHNIQUES Final Report
James P. Hollinger 30 Jun. 1974 143 p refs
(NRL Proj. G01-08)
(AD-A001302; NRL-MR-2953; USCG-D-31-75) Avail: NTIS CSCL 13/2

A technique for the remote determination of the thickness and volume of sea surface oil spills using multifrequency microwave radiometry was investigated. Aircraft-borne measurements were made at 19.3 and 31.0 or 69.8 GHz of a total of fifteen controlled marine oil spills. The microwave measurements of the oil spills of each oil type showed very similar results. The slicks formed an identifiable region with film thicknesses of a millimeter or more and containing the majority of oil which was surrounded by a very much larger and thinner slick which contained very little of the oil. Multifrequency passive microwave radiometry offers the potential to measure the distribution of oil in sea surface oil slicks, locate the thick regions, and measure their thickness and volume on an all-weather, day or night, and real time basis. GRA

N75-19647# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
THE USE OF REMOTE SENSING SYSTEMS FOR ACQUIRING DATA FOR ENVIRONMENTAL MANAGEMENT PURPOSES. REPORT 1: A PROCEDURE FOR PREDICTING IMAGE CONTRASTS IN PHOTOGRAPHIC REMOTE SENSOR SYSTEMS
Lewis E. Link, Jr. Nov. 1974 165 p refs
(DA Proj. 4A1-62121-A-896)
(AD-A002070; AEWES-TR-M-74-8-1) Avail: NTIS CSCL 14/5

Airborne remote sensors provide a potentially expedient technique for obtaining environmental data for baseline descriptions of multi purpose military installations or of impact of activities on the environment within a reasonable time and cost framework. Although the feasibility of using remote sensing techniques for these purposes has been demonstrated, the acquisition of imagery of sufficient quality to provide the necessary data for the many and diverse environmental features and phenomena of interest requires systematic and quantitative planning. This report presents an analytical procedure (referred to herein as the remote sensing simulation model) that provides a means for selecting a sensor system and mission profile objectively to enhance imagery for specific purposes. The model is computerized and calculates the amount of contrast that will occur between two features of interest on a photographic image as a function of reflectance properties of materials, atmospheric conditions, solar zenith angle, sensor altitude, and sensor characteristics. Illustrations of

model application to two hypothetical problems are given. The remote sensing simulation model provides a general tool for acquisition of photographic remote sensing techniques and evaluation of the applicability of these techniques to specific or general problem areas. GRA

N75-19668# General Electric Co., Pittsfield, Mass. Ordnance Systems.
DEVELOPMENT OF A GAS LASER SYSTEM TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES. VOLUME 1: GAS LASER SYSTEM MODIFICATIONS FOR OZONE MONITORING Final Report
S. E. Craig, D. R. Morgan, D. L. Roberts, and L. R. Snowman Jun. 1974 126 p refs 2 Vol.
(Contract EPA-68-02-0757)
(PB-236678/9; OS-74-13-Vol-1; EPA-650/2-74-046-A) Avail: NTIS HC $5.75 CSCL 14B

Modifications of a gas laser system for long path monitoring of trace atmospheric constituents by infrared absorption are described. Modifications were made in preparation for an ozone field measurement program wherein path monitor data were compared with those from a point monitor moved along the optical path. System modifications included incorporating a digital signal processor in the system and a spatial filter in the laser beam. Spectral studies of ozone, carbon dioxide, water vapor, ethylene and ammonia are presented in connection with the selection of laser wavelengths used in the system to discriminate ozone effects from interferences. Design considerations and a proposed configuration for an isotopic CO2 laser are presented. GRA

N75-19669# General Electric Co., Pittsfield, Mass. Ordnance Systems.
DEVELOPMENT OF A GAS LASER SYSTEM TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES. VOLUME 2: FIELD EVALUATION OF GAS LASER SYSTEM FOR OZONE MONITORING
W. A. McClenny, F. W. Baity, Jr., R. E. Baumgardner, Jr., R. A. Gray, and R. J. Gillmeister Jul. 1974 52 p refs 2 Vol.
(Contract EPA-68-02-0757)
(PB-236679/7; EPA-650/2-74-046-b-Vol-2) Avail: NTIS HC $4.25 CSCL 14B

Ambient ozone measurements in real time using an open-path monitor are described. These studies establish the sensitivity of an open-path monitor, based on transmissivity measurements of CO2 laser lines, less than or equal to 5 ppb and validate the values obtained during real-time monitoring of ambient ozone by establishing and using a methodology for the comparison of point monitor readings and open-path monitor readings over a common path. GRA

N75-19775# *Spangle (William) and Associates, Portola Valley, Calif.*
APPLICATION OF EARTH SCIENCE INFORMATION IN URBAN LAND-USE PLANNING, STATE-OF-THE-ART REVIEW AND ANALYSIS Final Report
22 Feb. 1974 341 p refs Prepared in cooperation with Baxter, McDonald and Smart, Inc., San Francisco, and Leighton (F. Beach) and Associates, La Habra, Calif. and Sponsored by USGS
(PB-238081/4; USGS-GD-74-038; Rept-5) Avail: NTIS HC $9.50 CSCL 13B

The report is an assessment of the state of the art (1974) in the application of earth science information of urban land-use planning and decision making. It includes an overview of the land use planning process, a discussion of natural resources and hazards, examples, sources, and applications of earth science information, a discussion of the interface between the earth sciences and land-use planning, and guidelines for planning and management applications of earth-science information. An appendix documents 20 case histories of the use of earth-science information in a wide range of planning applications at state, regional, county, and municipal levels of government. GRA

N75-19782*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Jan. 1975
Irvin J. Sattinger, Principal Investigator 20 Feb. 1975 5 p EREP
(Contract NAS9-13283)
(E75-10158; NASA-CR-142182; ERIM-103300-44-L) Avail: NTIS HC $3.25 CSCL 08B

N75-19786*# Earth Satellite Corp., Washington, D.C.
EVALUATION OF SKYLAB EREP DATA FOR LAND RESOURCE MANAGEMENT
David S. Simonett, Principal Investigator, Jack B. Bale, Wayne G. Rhode, and Darryl Goehring Jan. 1975 84 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13314)
(E75-10162; NASA-CR-142211) Avail: NTIS HC $4.75 CSCL 08B

N75-19788*# Sheffield Univ. (England). Dept. of Geography.
AUTOMATIC DATA EXTRACTION OF EARTH RESOURCES INFORMATION FROM SKYLAB IMAGERY OF S.E. SPAIN
J. L. vanGenderen, Principal Investigator Mar. 1975 16 p refs Sponsored by NASA EREP
(E75-10164; NASA-CR-142213) Avail: NTIS HC $3.25 CSCL 05B

N75-19789*# Boeing Co., Seattle, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Feb. 1975
David L. Tingey, Principal Investigator Feb. 1975 11 p EREP
(Contract NAS9-13303)
(E75-10165; NASA-CR-142214) Avail: NTIS HC $3.25 CSCL 04A

N75-19792*# Cornell Univ., Ithaca, N.Y. Coll. of Agriculture.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, 1 Feb. - 28 Feb. 1975
Ernest E. Hardy, Principal Investigator 28 Feb. 1975 2 p EREP
(Contract NAS9-13364)
(E75-10168; NASA-CR-142217) Avail: NTIS HC $3.25 CSCL 08B

N75-19795*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Feb. 1975
Irvin J. Sattinger, Principal Investigator 19 Mar. 1975 3 p EREP
(Contract NAS9-13283)
(E75-10171; NASA-CR-142220; ERIM-103300-46-L) Avail: NTIS HC $3.25 CSCL 08B

N75-19796*# Environmental Research Inst. of Michigan, Ann Arbor.
OIL POLLUTION DETECTION, MONITORING AND LAW ENFORCEMENT Quarterly Progress Report, Feb. 1975
Robert Horvath, Principal Investigator 20 Mar. 1975 2 p EREP
(Contract NAS9-13281)
(E75-10172; NASA-CR-142221; ERIM-101800-18-P) Avail: NTIS HC $3.25 CSCL 13B

N75-19803*# Honeywell, Inc., Lexington, Mass.
MULTISPECTRAL SCANNER DATA APPLICATIONS EVALUATION. VOLUME 2: SENSOR SYSTEM STUDY Final Report
Dec. 1974 112 p refs Prepared for Environmental Research Inst. of Michigan, Ann Arbor
(Contract NAS9-13386)
(NASA-CR-141690; ERIM-102800-40-F-Vol-2) Avail: NTIS HC $5.25 CSCL 14B

The optimization of a thematic mapper for earth resources application is discussed in terms of cost versus performance. Performance tradeoffs and the cost impact are analyzed. The instrument design and radiometric performance are also described. The feasibility of a radiative cooler design for a scanning spectral radiometer is evaluated along with the charge coupled multiplex operation. Criteria for balancing the cost and complexity of data acquisition instruments against the requirements of the user, and a pushbroom scanner version of the thematic mapper are presented. F.O.S.

N75-19805*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
STUDY OF USGS/NASA LAND USE CLASSIFICATION SYSTEM Interim Technical Report
G. William Spann and N. L. Faust Dec. 1974 48 p refs
(Contract NAS8-30653)
(NASA-CR-120709) Avail: NTIS HC $3.75 CSCL 08B

It is known from several previous investigations that many categories of land-use can be mapped via computer processing of Earth Resources Technology Satellite data. The results are presented of one such experiment using the USGS/NASA land-use classification system. Douglas County, Georgia, was chosen as the test site for this project. It was chosen primarily because of its recent rapid growth and future growth potential. Results of the investigation indicate an overall land-use mapping accuracy of 67% with higher accuracies in rural areas and lower accuracies in urban areas. It is estimated, however, that 95% of the State of Georgia could be mapped by these techniques with an accuracy of 80% to 90%. Author

N75-19807*# South Dakota State Univ., Brookings. Remote Sensing Inst.
USE OF REMOTE SENSING TECHNOLOGY FOR INVENTORYING AND PLANNING UTILIZATION OF LAND RESOURCES IN SOUTH DAKOTA Semiannual Progress Report, 1 Jul. - 31 Dec. 1974
31 Dec. 1974 72 p refs Original contains color illustrations
(Grant NGL-42-003-007)
(NASA-CR-142348; SDSU-RSI-75-02) Avail: NTIS HC $4.25 CSCL 08B

A comprehensive land use planning process model is being developed in Meade County, South Dakota, using remote sensing technology. The proper role of remote sensing in the land use planning process is being determined by interaction of remote sensing specialists with local land use planners. The data that were collected by remote sensing techniques are as follows: (1) level I land use data interpreted at a scale of 1:250,000 from false color enlargement prints of ERTS-1 color composite transparencies; (2) detailed land use data interpreted at a scale of 1:24,000 from enlargement color prints of high altitude RB-57 photography; and (3) general soils map interpreted at a scale of 1:250,000 from false color enlargement prints of ERTS-1 color composite transparencies. In addition to use of imagery as an interpretation aid, the utility of using photographs as base maps was demonstrated. Author

N75-19869# Oak Ridge Y-12 Plant, Tenn.
***DETERMINATION OF ARSENIC AND SELENIUM IN* SURFACE WATER BY ATOMIC ABSORPTION TO SUPPORT ENVIRONMENTAL MONITORING PROGRAMS**
H. G. King and R. W. Morrow 4 Nov. 1974 14 p refs
(Contract W-7405-eng-26)
(Y-1956) Avail: NTIS HC $3.25

A method was developed for determining arsenic and selenium in surface water by atomic absorption. The two elements are hydrided in acidified water by sodium borohydride to form arsine and selenine gases, which are then passed into a low temperature argon/air/hydrogen flame for the atomic absorption measurement. A background correction is made by adjusting the gas flow rates. The limit of detection is 5 micro g/l for arsenic and 1 micron g/l for selenium. The method is both fast and economical. Author (NSA)

N75-19894*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL OZONE CONTENT
Alfred C. Holland and Richard W. L. Thomas (Wolf Res. and Development Corp., Riverdale, Md.) Washington Mar. 1975 30 p refs
(NASA-TN-D-7877) Avail: NTIS HC $3.75 CSCL 04A

A study of techniques for measuring atmospheric ozone is reported. This study represents the second phase of a program designed to improve techniques for the measurement of atmospheric ozone. This phase of the program studied the sensitivity of Dobson direct sun measurements and the ozone amounts inferred from those measurements to variation in the atmospheric temperature profile. The study used the plane - parallel Monte-Carlo model developed and tested under the initial phase of this program, and a series of standard model atmospheres. Author

N75-20785*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report, 1 Sep. - 30 Nov. 1974
Frederick J. Thomson, Principal Investigator 1 Apr. 1975 3 p ref EREP
(Contract NAS9-13272)
(E75-10182; NASA-CR-142310; ERIM-101700-20-L; QPR-7) Avail: NTIS HC $3.25 CSCL 04A

N75-20786*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report, 1 Dec. 1974 - 28 Feb. 1975
Frederick J. Thomson, Principal Investigator 1 Apr. 1975 5 p EREP
(Contract NAS9-13272)
(E75-10183; NASA-CR-142311; ERIM-101700-21-L; QPR-8) Avail: NTIS HC $3.25 CSCL 04A

N75-20794*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Final Report, 1 Sep. 1972 - 15 Nov. 1974
John W. Hannah, Principal Investigator (Brevard County Planning Dept.), Garland L. Thomas (Brevard County Planning Dept.), Fernando Esparza, and James J. Millard 15 Dec. 1974 80 p Original contains imagery. Original photography may be purchased from the Eros Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21847)
(E75-10191; NASA-TM-X-69013; BCPD-L1-12) Avail: NTIS HC $4.75 CSCL 08B

The author has identified the following significant results. This is a study of applications of ERTS data to planning problems, especially as applicable to East Central Florida. The primary method has been computer analysis of digital data, with visual analysis of images serving to supplement the digital analysis. The principal method of analysis was supervised maximum likelihood classification, supplemented by density slicing and mapping of ratios of band intensities. Land-use maps have been prepared for several urban and non-urban sectors. Thematic maps have been found to be a useful form of the land-use maps. Change-monitoring has been found to be an appropriate and useful application.

Mapping of marsh regions has been found effective and useful in this region. Local planners have participated in selecting training samples and in the checking and interpretation of results.

N75-20797*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Final Report
Nicholas Gramenopoulos, Principal Investigator Feb. 1975 78 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21766)
(E75-10194; NASA-CR-142343) Avail: NTIS HC $4.75 CSCL 08B

The author has identified the following significant results. In the first part of the investigation, spatial and spectral features were developed which were employed to automatically recognize terrain features through a clustering algorithm. In this part of the investigation, the size of the cell which is the number of digital picture elements used for computing the spatial and spectral features was varied. It was determined that the accuracy of terrain recognition decreases slowly as the cell size is reduced and coincides with increased cluster diffuseness. It was also proven that a cell size of 17 x 17 pixels when used with the clustering algorithm results in high recognition rates for major terrain classes. ERTS-1 data from five diverse geographic regions of the United States were processed through the clustering algorithm with 17 x 17 pixel cells. Simple land use maps were produced and the average terrain recognition accuracy was 82 percent.

N75-20798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EARTH RESOURCES DATA CATALOG
1974 393 p refs Original contains color illustrations Prepared in cooperation with Martin Marietta Corp., Denver Original contains color illustrations
(NASA-TM-X-70411; JSC-09016) Avail: NTIS MF $2.25; SOD HC $8.75 CSCL 08F

An index of EREP photographs is provided along with information on how EREP data can be obtained. Suggestions are presented for possible utilization of the data in the following areas: land resource management; water resources; marine resources; landform surveys, geologic mapping, and mineral resources; agriculture, forest, and range resources; and environmental applications. It is intended to stimulate potential users to apply the data to their respective fields of interest. J.M.S.

N75-20811# Tennessee State Planning Office, Nashville.
LAND USE MAPPING IN TENNESSEE
Michael O. Webb, comp. and John M. Wilson, comp. Oct. 1974 88 p
(Grant HUD-CPA-TN-04-37-1030)
(PB-238442/8; TN-STAE-74-1030-1) Avail: NTIS HC $4.75 CSCL 08B

An inventory of existing land use mapping in Tennessee is presented. Tables are included showing published maps at statewide, multi-county, county, and municipal scales. Existing scales and classification systems are discussed and suggestions and recommendations made for future maps to be more compatible. The availability of hyperaltitude and satellite photography in all parts of Tennessee is illustrated, as are the areas of jurisdiction for planning agencies in Tennessee. GRA

N75-20893# Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div.
AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973
J. N. DeVilliers Sep. 1973 19 p Supersedes Rept-73-16
(DR-73-7; Rept-73-16) Avail: NTIS HC $3.25

An airborne exercise is described employing various sensors to investigate their ability to detect and map Louisiana crude and naptha oil spills, both by day and by night. It is shown that photographic, infrared scanning, and low light level television all have some ability to detect Louisiana, but only infrared scanning detected naptha. None of these sensors could identify the anomalies as oil. A laser fluorosensor showed promise in detecting oil at night. Author

N75-20898# European Space Research Organization, Paris (France).
HIGH RESOLUTION INFRARED SPECTROMETRY APPLIED TO THE STUDY OF MINOR ATMOSPHERIC CONSTITUENTS AND POLLUTANTS
Denis Bargues Feb. 1975 122 p refs Transl. into ENGLISH of "Spectrometrie Infrarouge a Haute Resolution Appliquee a l'Etude de Constituants Mineurs de l'Atmosphere et de Polluants Atmospheriques", ONERA, Paris Report ONERA-NT-213, 1973
(ESRO-TT-131; ONERA-NT-213) Avail: NTIS HC $5.25

Numerical data processing methods suitable for high-resolution spectrometers and for the determination of atmospheric constituents using grating spectrometers is discussed. A general review of the theory of the grating spectrometer is given along with the signal modulation provided by various types of gratings. The characteristics and performance of the numerical data acquisition circuit are cited. The various methods of data processing are divided into two categories which include methods to improve the accuracy of the line definition (numerical filtering and double derivation), and a method to afterwards improve the resolution by numerical reconstruction of the frequencies not transmitted by the spectrometer. The results of the nu sub 2 band of ammonia at 10 microns and the atmospheric spectrum between 7 and 8 microns are presented. ESRO

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GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A75-19990 **Ice shelves and ice flow.** G. Robin (Scott Polar Research Institute, Cambridge, England). *Nature*, vol. 253, Jan. 17, 1975, p. 168-172. 16 refs.

About 1,500,000 sq km of the ice covering Antarctica are in the form of floating slabs of ice round the periphery of the continent. The largest of these is the Ross Ice Shelf. Problems regarding the motion of streams of ice within an ice shelf are being investigated in the studies of the Ross Ice Shelf Project. Data are presented which were obtained in connection with extensive airborne soundings of the ice shelf made during the period from 1967 to 1972. Thickness pattern and streamlines of flow are considered along with questions regarding the velocity distribution within the Ross Ice Shelf. G.R.

A75-20695 * # **Microwave maps of the polar ice of the earth.** P. Gloersen, T. T. Wilheit, T. C. Chang, W. Nordberg (NASA, Goddard Space Flight Center, Greenbelt, Md.), and W. J. Campbell (U.S. Geological Survey, Tacoma, Wash.). *American Meteorological Society, Bulletin*, vol. 55, Dec. 1974, p. 1442-1448. 13 refs.

Synoptic views of the entire polar regions of earth have been obtained free of the usual persistent cloud cover using a scanning microwave radiometer operating at a wavelength of 1.55 cm on board the Nimbus-5 satellite. Three different views at each pole are presented utilizing data obtained at approximately one-month intervals from December 1972 to February 1973. Large discrepancies exist between the long-term ice cover depicted in various atlases and the actual extent of the canopies. The distribution of multiyear ice in the north polar region is markedly different from that predicted by existing ice dynamics models. Irregularities in the edge of the Antarctic sea ice pack occur that have neither been observed previously nor anticipated. The brightness temperatures of the Greenland and Antarctic glaciers show interesting contours probably related to the ice and snow morphologic structure. (Author)

A75-20921 # **Use of mechanooptic devices for relief mapping from high-altitude photographs (Primenenie priborov optiko-mekhanicheskogo tipa dlia otobrazheniia rel'efa po snimkam, poluchennym s bol'shikh vysot).** G. D. Fedoruk, B. V. Krasnopevtseva, and N. I. Konstantinova. *Geodeziia i Kartografiia*, Dec. 1974, p. 38-41. In Russian.

A75-20922 # **Results of field control of accuracy of relief mapping with general-purpose instruments when producing 1:2000 scale maps (Rezul'taty polevogo kontrolia tochnosti s'emki rel'efa na universal'nykh priborakh pri sozdanii planov v masshtabe 1:2000).** N. F. Viniatskii. *Geodeziia i Kartografiia*, Dec. 1974, p. 42-47. In Russian.

Stereoscopic aerial photographs, with a scale of 1:6000 or 1:7300, were made of an area in which various altitude reference points were located. The accuracy of 1:2000 scale relief maps produced from the slides on SD-3 general purpose instruments was studied. It was found that the vegetation in an area has a significant effect on the accuracy of height determinations. A combined method is recommended for relief mapping of large swamp areas. A.T.S.

A75-21000 **Mapping of the 1973 Mississippi River floods by the NOAA-2 satellite.** D. R. Wiesnet, D. F. McGinnis, and J. A. Pritchard (NOAA, National Environmental Satellite Service, Suitland, Md.). *Water Resources Bulletin*, vol. 10, Oct. 1974, p. 1040-1049. 6 refs.

It is demonstrated that the NOAA-2 very high resolution radiometer (VHRR) data provided a good delineation of the flooded Mississippi River area on March 27, 1973 and on May 4, 1973. These data compare favorably with higher-resolution ERTS-1 flood delineation whose cartographic accuracy is well known. Color densitometer enhanced versions of the VHRR-IR images show dramatically their correspondence to the mapped flood plain. Substantial limitations of the NOAA-2 VHRR are mentioned. S.J.M.

A75-21794 # **Comparison of the precision of two methods for the determination of the geocentric coordinates of the subsatellite point.** G. Horedt (Cluj, Universitatea, Cluj, Rumania). *Artificial Satellites*, vol. 9, Dec. 1974, p. 35-39. 8 refs.

A criterion for the comparison of the precision of two or more methods is given. As an application, the equivalence of two methods, the method of cosmic triangulation and the subsat method for the determination of the geocentric coordinates of the subsatellite point, is shown. (Author)

A75-22529 # **The application of ERTS results in the Republic of South Africa.** O. G. Malan (National Physical Research Laboratory, Pretoria, Republic of South Africa). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 52-73.

The analysis of ERTS imagery of the Republic of South Africa had, for various reasons, to be connected to current national resource survey programs. Despite the disadvantages of this approach, it led to the rapid practical application of ERTS data, such as in the final revision of the first national geomorphological map and the initiation of a national structural geological map. Aspects of these applications as well as of the value of ERTS imagery in plant ecological mapping, land use mapping, the mapping of burnt and degraded areas, and for general agricultural purposes are discussed. Attention is also given to the methods of image reproduction and analysis employed and the practical problems encountered. (Author)

A75-23326 * **International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings.** Symposium sponsored by the Battelle Columbus Laboratories, U.S. Defense Mapping Agency, NASA, NOAA, NSF, and U.S. Navy. Washington, D.C., Marine Technology Society, 1974. 464 p. $12.

Requirements for marine geodesy are examined, taking into account accuracy requirements for certain marine operations, boundary and positioning problems in offshore Norway, navigation requirements for nodule exploration and mining, and the determination of marine boundaries at sea. Subjects related to marine geodesy and positioning/navigation are discussed along with topics concerned with marine geodesy and ocean physics. Satellite altimetry and modern geoids method are considered and attention is given to marine gravity anomalies and geodesy.

G.R.

A75-23327 * **Requirements and applications of marine geodesy and satellite technology to operations in the oceans.** A. G. Mourad and D. M. J. Fubara (Battelle Columbus Laboratories, Columbus, Ohio). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 15-27. 23 refs. Research supported by the Battelle Columbus Laboratories and NASA.

Marine geodesy is concerned with the determination of marine geographic positions, geodetic controls, and the geoid. The activities

of marine geodesy are related to the utilization of satellite technology, electronic distance measurement, geodetic astronomy, gravimetric geodesy, and the potentially usable very long baseline interferometry. Assessments are made of the different accuracy and/or precision requirements involved in the various approaches. It is shown that marine geodesy is highly relevant to man's various practical and scientific operations at sea, including those on the continental shelves. G.R.

A75-23330 Satellite techniques in geophysics and their relationship to marine geodesy. M. A. Khan. In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 87-112. 7 refs.

A statistical evaluation of some of the recent satellite-determined gravity models, including some with distinct data base, indicates that the geopotential coefficients of these models are individually meaningful for frequencies with wavenumbers 2 through 7 certainly and wavenumbers 8 through 10 probably. Geopotential coefficients in higher frequency ranges while apparently important for computing accurate satellite orbits seem to have little geophysical significance in an individual sense. Differences between various gravity models and those between purely satellite determined geopotential models and their associated combination models show no consistent relationship to surface gravimetric coverage. Additional classical tracking data are important in improving the existing description of the earth's gravity field but their contribution in extending its frequency range beyond what is now available is uncertain. New tracking data types such as laser, satellite-to-satellite and altimetry data seem to have the potential of improving gravity field description but a quantitative assessment of their contribution is difficult at this stage. (Author)

A75-23342 * Results of geodetic processing and analysis of Skylab altimetry data. D. M. J. Fubara and A. G. Mourad (Battelle Columbus Laboratories, Columbus, Ohio). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 301-314. 16 refs. NASA-sponsored research.

A geodetic analysis of Skylab S-193 altimeter preliminary data from mission SL/2 and EREP pass 9 is considered. The overall objective of the investigation was a demonstration of the feasibility of a use of altimeter data for the determination of the geoid in ocean areas. The geoid is the equipotential surface that would coincide with an 'undisturbed' mean sea level of the earth's gravity field. Analytical data handling formulations are discussed. G.R.

A75-23345 The application of GEOS-C data to marine geodesy by means of the simple-density layer concept. F. Morrison (NOAA, Geodetic Research and Development Laboratory, Rockville, Md.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 345-355. 24 refs.

Questions concerning the practical implementation of surface coating geopotential models are reviewed and attention is given to the capabilities of surface coating methods and algorithms to cope with the GEOS-C altimeter data. Prediction problems and truncation errors are considered along with approaches for estimating the density block size for GEOS-C data reduction. It is found that a surface density layer modeled locally will provide a suitable method for parameterizing the results of the GEOS-C altimeter data. G.R.

A75-23747 * New uses of shadow enhancement. D. L. Sawatzky and K. Lee (Colorado School of Mines, Golden, Colo.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 1-18. Grant No. NGL-06-001-015; Contract No. NAS9-13394.

Shadow enhancement of topographic linears in photographic or scanner images is a valuable tool for interpretation of geologic structures. Whether linears will be enhanced or subdued depends on sun angle and azimuth. The relationship of the sun's attitude to topographic slopes determines which trends are available for interpretation in existing imagery, and it can be used to select the time of day, surface properties, and film and filter characteristics in planning aircraft flights or satellite orbital passes. The technique of selective shadow enhancement can be applied to all photographic or imaging experiments, but is best for snow-covered scenes, side-looking radar images, and painted relief models. (Author)

A75-23778 Space photography for revision of topical maps of the World Physico-Geographical Atlas. B. V. Vinogradov (Akademiia Nauk SSSR, Moscow, USSR). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 561-571. 11 refs.

A75-24603 # Determination of the length of an earth's chord connecting two space-triangulation points (Opredelenie dliny zemnoi khordy, soediniaiushchei dva punkta kosmicheskoi triangulia-tsii). N. A. Kutserib (Ukrainskii Institut Inzhenerov Vodnogo Khoziaistva, Ukrainian SSR). *Geodeziia, Kartografiia i Aerofotos'emka*, no. 19, 1974, p. 83-87. In Russian.

Expressions are derived for calculating the length of an earth's chord from the (known) geocentric coordinates of one of the terminal points of the chord, the geodetic heights of each of the terminal points, and the spherical coordinates of the chord's direction, obtained from synchronous satellite observations. Differential corrections for the solution are obtained. Analysis of the influence of initial-data errors shows that the method is more accurate for long chords. V.P.

A75-24605 # Relationship between transverse and longitudinal distortions of urban and engineering traverses (O sootnoshenii poperechnogo i prodol'nogo sdvigov v khodakh gorodskoi i inzhenernoi poligonometrii). I. S. Trevogo (L'vovskii Politekhnicheskii Institut, Lvov, Ukrainian SSR). *Geodeziia, Kartografiia i Aerofotos'emka*, no. 19, 1974, p. 100-106. 5 refs. In Russian.

The inadequacy of using the principle of equal influences for calculating the accuracy of traverses is demonstrated, and the use of the most probable ratio of longitudinal to transverse distortions of traverses is proposed. Formulas in which this ratio is taken into consideration are derived, and values of the ratio (calculated on the basis of accuracy indices obtained from extensive field data) are tabulated. V.P.

A75-26506 * Post-earthquake dilatancy recovery. C. H. Scholz (Lamont-Doherty Geological Observatory; Columbia University, Palisades, N.Y.). *Geology*, Nov. 1974, p. 551-554. 18 refs. NSF Grant No. GA-36357X; Grant No. NGR-33-008-146.

Geodetic measurements of the 1964 Niigata, Japan earthquake and of three other examples are briefly examined. They show exponentially decaying subsidence for a year after the quakes. The observations confirm the dilatancy-fluid diffusion model of earthquake precursors and clarify the extent and properties of the dilatant zone. An analysis using one-dimensional consolidation theory is included which agrees well with this interpretation. S.J.M.

A75-27082 The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens,

Greece, May 14-21, 1973. Symposium sponsored by the International Union of Geodesy and Geophysics, International Association of Geodesy, and COSPAR. Edited by G. Veis (Athens, National Technical University, Athens, Greece). Athens, National Technical University of Athens, 1974. 989 p. In English and French. $24.

Papers are presented dealing with precise satellite tracking methods and techniques for satellite orbit calculation and geopotential and geoid determination. Some of the topics covered include progress in laser ranging to satellites, laser pulse analysis, even zonal harmonics from satellite observations by collocation, geodetic analyses through numerical integration, solid earth and fluid tides from satellite orbit analyses, determination of oceanic geoid from short arc reductions of satellite altimetry, resonance effects in decaying satellite orbits and their use in studies of the geopotential, and a combination of satellite and gravimetric data using the concept of least squares collocation.

P.T.H.

A75-27100 Geodetic analyses through numerical integration. R. J. Anderle (U.S. Naval Material Command, Naval Weapons Laboratory, Dahlgren, Va.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 253-265. 9 refs.

Geodetic analyses were made of observations of artificial earth satellites using numerical integration of the equations of motion of the satellites, rather than general theory. Some of the problems unique to numerical integration are summarized. The discussion covers the reference frame, constants of integration, radiation-pressure discontinuities, truncation errors, and interpolation errors. The coordinates determined by satellite measurements are compared with those derived from geodimeter measurements. The numerical-integration method yielded geodetic coordinates to 1 m accuracy, pole position accurate to 20 cm over five days, and reasonable variations in station position over ten years. The principal error source is the uncertainty in the effect of gravity on satellites at 1000 km altitude. A.T.S.

A75-27103 Analytical expressions for earth tides perturbations on close earth satellites (Forme analytique des perturbations de marées terrestres sur les satellites artificiels). G. Balmino (Groupe de Recherches de Géodésie Spatiale, Brétigny-sur-Orge, Essonne, France). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 313-322. 6 refs. In French.

An analytical formulation of earth tides perturbations on artificial satellites has been derived, generalizing the expansions given by W. Kaula in 1969. In particular, tesseral harmonics of longitude (and latitude) dependent Love numbers have been considered. Some examples of long period perturbations for actual geodetic satellites are given. (Author)

A75-27107 Solid earth and fluid tides from satellite orbit analyses. K. Lambeck (Groupe de Recherches de Géodésie Spatiale; Paris, Observatoire, Meudon, Hauts-de-Seine, France), A. Cazenave, and G. Balmino (Groupe de Recherches de Géodésie Spatiale, Brétigny-sur-Orge, Essonne, France). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973.
Athens, National Technical University of Athens, 1974, p. 353-393. 52 refs.

Theories of the solid-earth, oceanic, and atmospheric tides are reviewed. The perturbations caused by the solid-earth and the fluid tides in the motion of near-earth satellites are discussed. The most important aspects of earth-tide studies concern phase lag, possible resonance at some diurnal frequencies, and the use of the ocean loading to improve ocean-tide models. It is shown that corrections must be introduced for both fluid tides if one wishes to observe the amplitudes and phase lag associated with the solid-earth tide. Neglecting the ocean tides can produce errors of more than 10 percent in the Love number k2 and of several degrees in the phase lag. Errors in the principal solar semidiurnal tide due to the atmospheric tide are smaller, but not negligible. A.T.S.

A75-27110 Accuracy estimation of geophysical parameters and astronomical constants in relation to long baseline interferometry. H. G. Walter (Paris, Observatoire, Meudon, Hauts-de-Seine, France). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 417-426. 7 refs.

A75-27119 On the use of base-chord lengths for the investigation of local crustal movements. B. Kolaczek (Warszawa, Politechnika, Warsaw, Poland) and P. Wilson (Institut für angewandte Geodäsie, Frankfurt am Main, West Germany). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 597-606. 15 refs.

The influence of increased measuring accuracies on the applications of satellite geodesy to geodynamical studies is discussed briefly. A method is given for determining base-chord lengths from simultaneous range and direction observations to a satellite and the achievable accuracy is estimated for the case of combined laser and photographic observations. An experiment involving currently operating European stations is proposed. (Author)

A75-27121 The contribution of optical directions, laser ranges and Doppler range differences to the geometrical strength of satellite networks. J. Campbell (Bonn, Universität, Bonn, West Germany). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 613-619. 12 refs.

Numerical investigations are carried out in order to study the effect that observed satellite directions, Laser ranges and Doppler range differences have on the accuracy of second order points included in a first order net. The observations are weighted according to experiences gathered in recent campaigns. Point errors are determined using each type of observation individually as well as in combined solutions. Results indicate a slight superiority of Laser ranges and Doppler range differences over optical directions. Furthermore combinations of Laser ranges with either directions and/or Doppler observations yield better results than a comparable number of observations of the same type. (Author)

A75-27122 On the proper role of satellite geodesy. J. A. Weightman (Mapping and Carting Establishment, Geodetic Office, Feltham, Middx., England). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973.
Athens, National Technical University of Athens, 1974, p. 621-630.

The paper sets out to assess the proper role of satellite geodesy in a rational geodetic control network. It considers the possibilities and limitations of the new techniques in terms of absolute and relative accuracy, as well as of economy of effort, and seeks to establish working criteria for the optimum spacing of (1) regional satellite network stations (collocated points), and (2) isolated satellite fixes (from global orbital information). It examines the effect of the new data upon survey requirements in the fields of classical ground geodesy and field astronomy, and suggests basic principles for fitting all data together in a single geodetic control framework. (Author)

A75-27131 * Global detailed gravimetric geoid. S. Vincent (Computer Sciences Corp., Falls Church, Va.) and J. G. Marsh

(NASA, Goddard Space Flight Center, Greenbelt, Md.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 825-855. 33 refs.

A global detailed gravimetric geoid has been computed by combining the Goddard Space Flight Center GEM-4 gravity model derived from satellite and surface gravity data and surface 1 x 1-deg mean free-air gravity anomaly data. The accuracy of the geoid is plus or minus 2 meters on continents, 5 to 7 meters in areas where surface gravity data are sparse, and 10 to 15 meters in areas where no surface gravity data are available. Comparisons have been made with the astrogeodetic data provided by Rice (United States), Bomford (Europe), and Mather (Australia). Comparisons have also been carried out with geoid heights derived from satellite solutions for geocentric station coordinates in North America, the Caribbean, Europe and Australia. (Author)

A75-27135 **Determination of the geopotential.** E. M. Gaposchkin, M. Williamson, Y. Kozai, and G. Mendes (Smithsonian Astrophysical Observatory, Cambridge, Mass.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 901-966. 36 refs.

The significance of terrestrial gravity data is considered. The primary objective of the analysis of terrestrial gravity data is to obtain mean anomalies for regions 550 km x 550 km. When these data are combined with the satellite-perturbation analysis, the spherical harmonics representing the geopotential can be determined. The analysis of satellite orbital data is discussed along with the coefficients of zonal spherical harmonics in the geopotential, the determination of tesseral harmonics, and an evaluation of the results of the investigation. G.R.

A75-27332 * # **Automated thematic mapping and change detection of ERTS-1 images.** N. Gramenopoulos (Itek Corp., Lexington, Mass.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 82-96. 6 refs. NASA-supported research.

A system that inventories and updates resources must be capable of recognizing resources and their changes rapidly, using imagery acquired by a resources satellite such as ERTS-1. The conversion of ERTS images to thematic maps showing the distribution of resources is the first step in the data reduction process. To accomplish this task, the resources must be recognized from spatial and multispectral signatures. In addition, resource boundaries must be accurately established, and the data from different acquisition dates must be registered. This paper describes a system that combines multispectral and spatial pattern recognition techniques to produce thematic maps. This system has been applied to ERTS-1 MSS images, and the results obtained are discussed. (Author)

A75-29129 # **Fundamental ideas of satellite geodesy (Osnovnye idei sputnikovoi geodezii).** G. Karsky. In: INTERKOSMOS. Prague, Astronomicky Ustav Ceskoslovenske Akademie Ved, 1974, p. 143-151. 10 refs. In Russian.

Satellite geodesy can be used to overcome the limitations of purely ground-based methods for establishing the earth ellipsoid. Geometric methods of satellite geodesy involve synchronous observations of the satellite from two or more ground stations to determine their relative positions. Orbital methods assume that the satellite position and orbit are known to find the position of a ground station without synchronous observation. Dynamic methods use the satellite as a test body moving freely in the earth's gravitational field in order to determine the characteristics of the field and to refine the station coordinates. Laser rangefinders are presently the most important means for improving satellite geodesy because they significantly increase the accuracy of satellite position determinations. A.T.S.

N75-16035*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Dec. 1974
Victor I. Myers, Principal Investigator 20 Jan. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10114; NASA-CR-141347) Avail: NTIS HC $3.25 CSCL 05B

N75-16054* Geological Survey, Menlo Park, Calif. National Center for Earthquake Research.
PERFORMANCE OF THE ERTS-1 DCS IN A PROTOTYPE VOLCANO SURVEILLANCE SYSTEM
Peter L. Ward *In* NASA. Wallops Station Data Collection System 1975 p 31-44
CSCL 08F

A prototype volcano surveillance system has been installed on 15 volcanoes in four states and four countries. The need for this system, the techniques used, the method of implementation, the major problems, the results, and the future seen for such a system are briefly reviewed. Author

N75-16955*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Dec. 1974
Allan Shapiro, Principal Investigator 10 Feb. 1975 1 p EREP
(NASA Order T-4716-B)
(E75-10136; NASA-CR-142064) Avail: NTIS HC $3.25 CSCL 08E

N75-16963# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
THE REMOTE IDENTIFICATION OF TERRAIN FEATURES AND MATERIALS AT A VIRGINIA TEST SITE: AN INVESTIGATIVE STUDY OF MULTISPECTRAL SENSING TECHNIQUES Interim Report, Apr. 1970 - Dec. 1972
Thomas W. Wagner and Philip G. Hasell, Jr. Jan. 1974 75 p refs
(Contract DOT-FH-11-7136)
(PB-236513/8; ERIM-196200-7-T; FHWA-RD-74-10) Avail: NTIS HC $4.25 CSCL 14E

This report documents the collection, processing, and analysis of multispectral remote sensor data from a 2-by 13-mile study site in Augusta County, Virginia. The objectives of this study were to develop and test, using analog processing facilities, techniques for the identification and automatic discrimination of selected terrain features and natural materials. Aircraft data were collected in up to 15 spectra bands at two times of the day during two different seasons. A ratio image-enhancement procedure and multi-object discrimination techniques were tested. Each of these techniques is described and the results illustrated. GRA

N75-17773# Sandia Labs., Albuquerque, N.Mex.
RANGE-SCAN RADAR IMAGES AND THEIR APPLICATION TO MAP-MATCHING ESTIMATION OF LOCATION
L. T. James and E. A. Aronson Sep. 1974 17 p refs
(Contract AT(29-1)-789)
(SAND-74-0153) Avail: NTIS HC $3.25

The results are reported of experiments that demonstrate that a pulse radar sensor with a nondirectional antenna pattern produces images containing enough character to serve as signatures of the sensor's location when operating over the types of scenes considered. This property is a necessary condition if this type of sensor is to be employed in the design of a map matching location estimation system for use in improving the navigation accuracy of airborne inertial navigation systems. Author (NSA)

N75-19780*# Geological Survey, Reston, Va.
CARTOGRAPHIC EVALUATION OF SKYLAB S-192 SCANNER IMAGES Quarterly Progress Report, 1 Nov. 1974 - 31 Jan. 1975
John D. McLaurin, Principal Investigator 31 Jan. 1975 7 p EREP
(NASA Order T-4111-B)
(E75-10156; NASA-CR-142180) Avail: NTIS HC $3.25 CSCL 08B

N75-19793*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Jan. - Feb. 1975
Allan Shapiro, Principal Investigator 19 Mar. 1975 1 p EREP
(NASA Order T-4716-B)
(E75-10169; NASA-CR-142218) Avail: NTIS HC $3.25 CSCL 08B

N75-19816# Army Foreign Science and Technology Center, Charlottesville, Va.
FIFTY YEARS OF GEODETIC, PHOTOGRAMMETRIC AND CARTOGRAPHIC LITERATURE IN THE USSR
S. A. Salysev 29 Aug. 1974 19 p Transl. into ENGLISH from Geod. Kartografiya (USSR), v. 12, 1972 p 68-73
(AD-A002716; FSTC-HT-23-0216-74) Avail: NTIS CSCL 08/2
The article presents a historical survey of all publications on geodesy, cartography, photogrammetry and aerial surveying published in the Soviet Union in the last fifty years. GRA

N75-20683*# Battelle Columbus Labs., Ohio.
APPLICATIONS OF SATELLITE AND MARINE GEODESY TO OPERATIONS IN THE OCEAN ENVIRONMENT
D. M. Fubara and A. G. Mourad Mar. 1975 120 p refs
(Contract NAS6-2006)
(NASA-CR-141395) Avail: NTIS HC $5.25 CSCL 14B
The requirements for marine and satellite geodesy technology are assessed with emphasis on the development of marine geodesy. Various programs and missions for identification of the satellite geodesy technology applicable to marine geodesy are analyzed along with national and international marine programs to identify the roles of satellite/marine geodesy techniques for meeting the objectives of the programs and other objectives of national interest effectively. The case for marine geodesy is developed based on the extraction of requirements documented by authoritative technical industrial people, professional geodesists, government agency personnel, and applicable technology reports. Author

N75-20780*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Feb. 1975
Roger M. Hoffer, Principal Investigator Feb. 1975 6 p EREP
(Contract NAS9-13380)
(E75-10177; NASA-CR-142305) Avail: NTIS HC $3.25 CSCL 05B

N75-20800*# Scientific Translation Service, Santa Barbara, Calif.
SATELLITE GEODESY WITH LASERS
D. G. King-Hele Washington NASA Apr. 1975 12 p refs Transl. into ENGLISH from Laser/Elektro-Optik, v. 6, Sep. 1974 p 24-27
(Contract NASw-2483)
(NASA-TT-F-16238) Avail: NTIS HC $3.25 CSCL 08E
Measurement of the earth's surface using laser methods, satellite tracking methods, and mathematical methods is discussed. Mathematical methods associated with the determination of the earth's geopotential are included. Author

N75-20801*# Battelle Columbus Labs., Ohio.
MARINE GEODETIC CONTROL FOR GEOIDAL PROFILE MAPPING ACROSS THE PUERTO RICAN TRENCH
D. M. Fubara and A. G. Mourad Mar. 1975 49 p refs
(Contract NAS6-20068)
(NASA-CR-141396) Avail: NTIS HC $3.75 CSCL 08B
A marine geodetic control was established for the northern end of the geoidal profile mapping experiment across the Puerto Rican Trench by determining the three-dimensional geodetic coordinates of the four ocean-bottom mounted acoustic transponders. The data reduction techniques employed and analytical processes involved are described. Before applying the analytical techniques to the field data, they were tested with simulated data and proven to be effective in theory as well as in practice. Author

N75-20827# Army War Coll., Carlisle Barracks, Pa.
THE ROLE OF THE DEFENSE MAPPING AGENCY INTER AMERICAN GEODETIC SURVEY (DMA IAGS) IN NATION BUILDING Student Essay
Hector Wood 21 Oct. 1974 30 p refs
(AD-A003149) Avail: NTIS CSCL 08/2
The paper discusses whether the operations of the DMA IAGS make a significant contribution to the development of Latin American countries. The DMA IAGS has been in Latin America since 1946 collaborating with Latin American countries in mapping operations. During this time DMA IAGS has guided and partially funded the establishment of thousands of miles of geodetic control, photographed large land areas, school trained over 3600 personnel and produced thousands of topographic maps. The geodetic control, cartographic products, and trained personnel are essential, basic tools for the development of Latin American countries. Highway construction, river navigation, hydroelectric dams, and oil exploration are a few of the projects that are dependent on the topographic capability being established on each country by DMA IAGS. GRA

N75-20828# Naval Oceanographic Office, Washington, D.C.
THEORY AND PRACTICE OF GEOPHYSICAL SURVEY DESIGN Final Report
Thomas M. Davis Oct. 1974 151 p refs
(HF52552)
(AD-A003078; NOO-RP-13) Avail: NTIS MF $2.25; HC $3.00 available from Naval Oceanographic Office, Washington, D. C. 20373 CSCL 08/2
A theory for designing parallel track-type geophysical surveys, as well as the necessary numerical algorithms for implementing this theory, is developed which is easily applied to many different sampling problems. Within this context, survey design consists of defining the appropriate track spacing, track direction, and down-track sampling rate which will produce a set of discrete digital measurements describing the environment to a predetermined accuracy. Several practical applications are presented to illustrate the adaptability of the theory. GRA

04
GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

A75-20200 **Geologic applications of thermal infrared images.** K. Watson (U.S. Geological Survey, Denver, Colo.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 128-137. 50 refs.

A theoretical model for the analysis of planetary surface temperature distribution is developed. The model makes it possible to obtain a quantitative estimate of the effects of various geologic, meteorologic, and topographic factors. Questions of geothermal mapping are discussed along with aspects of thermal inertia mapping. The dependence of thermal inertia on density, on moisture content, and, to some degree, on composition suggests that the technique should be useful to discriminate a great variety of geologic materials and conditions. G.R.

A75-20201 **The potential role of thermal infrared multispectral scanners in geological remote sensing.** R. K. Vincent (Geospectra Corp., Ann Arbor, Mich.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 137-147. 26 refs.

The thermal infrared wavelength region from 8.0 to 14.0 micrometers contains a great amount of compositional information, especially for silicate rocks, in the form of emittance minima caused by interatomic vibrations. Theoretical details regarding mineral spectra are considered along with the possibilities for infrared ratio imaging provided by existing multispectral scanners. The current potential of multispectral scanners can possibly be significantly improved by the development of more advanced scanner models. G.R.

A75-22540 # **Lineaments geological meaning on ERTS images - Its application on mineral exploration.** C. Brockmann (Servicio Geológico de Bolivia, La Paz, Bolivia). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 257-282.

The ERTS-Bolivia program, being a project where many subjects are involved, is carrying out research on cartography, geology, agriculture, and hydrology. It has been found that the lineaments for geological use are identifiable with more clearness on channel 7 of the multispectrum system. It also provides more information than the conventional aerial photographs, the photoindex and photomosaic, due probably to the great regional coverage of an image and also because these features are shown more clearly on regions where high reflection field and high reflection vegetation exist. Considering their characteristics, the lineaments were classified according to their genesis, tendency, frequency, and distribution. Such classification is as follows: morpholithological boundary lineaments; morphological boundary lineaments; lineaments related to fracture zones; lineaments connected to faults and geotectonical lines. As it has been found that mineral deposits exist where lineaments are, it has been considered as valuable information to be used in the prospection of new potentially mineral areas. (Author)

A75-22541 # **Remote sensing applications for geology and mineral resources in the Brazilian Amazon region.** G. Amaral (Instituto de Pesquisas Espaciais, São José dos Campos; São Paulo, Universidade, São Paulo, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 283-302. 6 refs.

The utilization of ERTS-1 and SLAR imagery for geological mapping and prospection of mineral resources in the Brazilian Amazon region is discussed. The repetitive capability of the ERTS system has proved successful for obtaining an almost complete cloud-free coverage for the 5 million sq km of that region. Extensive comparison between both systems has shown that the multispectral data of the ERTS-1 program has higher capabilities for those objectives, since it gives similar amount of structural information, but gives a larger amount of lithological information. Some large mineral deposits and highly prospective geologic units, such as the 17 billion tons iron deposits of the Serra dos Carajás District and the tin-bearing circunscrite granites of the Xingu River Valley are clearly discernible in the ERTS-1 imagery. With aid of the remote sensing data, and using literature analysis as ground truth, it was possible to make a geological map of the region, at a 1:5,000,000 scale, in about three months. (Author)

A75-22542 # **Geological remote sensing of São Francisco Basin - Interpretative results from analysis of ERTS-1-MSS imagery.** C. C. Liu, S. K. Yamagata (Instituto de Pesquisas Espaciais, São José dos Campos, Brazil), and C. C. Carraro (Instituto de Pesquisas Espaciais, São José dos Campos; Rio Grande do Sul, Universidade Federal, Rio Grande do Sul, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 303-319. 23 refs.

This is the first attempt to use the imagery produced by the Multispectral Scanner Subsystem (MSS) of the first Earth Resources Technology Satellite (ERTS-1) as a geological reconnaissance tool in mapping a broad region from the upper drainage area of the São Francisco Basin to the northeast rim of the Parana basin. The ERTS' MSS imagery was studied and evaluated by conventional techniques of photointerpretation since the MSS imagery can be studied as a photo-like image. The interpreter recognizes terrains by analysing and interpreting photo-like elements such as drainage patterns, landforms, tonality, characteristic features, vegetation, and so on. From the study and analysis of such elements and the geomorphic continuity a series of interpretative mapping units can be differentiated, and various tectonic features can be identified. ERTS' MSS imagery is proving to be an effective remote sensing tool for regional geologic reconnaissance in Brazil. (Author)

A75-23767 **Rock type discrimination using radar imagery.** P. J. Cannon (Texas, University, Austin, Tex.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 339-352. 8 refs.

Geologic mapping from radar imagery of the Wichita and Arbuckle Mountains of southern Oklahoma indicates that in areas of sparse to moderate vegetation, certain rock types can be readily discriminated on the radar imagery. They can be distinguished because the returns of radar energy from rock outcrops are strongly influenced by the geometry of the rock surfaces. The angular configuration exhibited by the outcrop is the most important factor in returning the propagated radar energy to an airborne receiver. The outcrop geometry can vary greatly between rock types due to the differences in grain size, rates of weathering, and structure. The scale of the outcrop geometry in relation to the wavelength of the propagated radar energy is also an influencing factor of importance. (Author)

A75-23769 * **An evaluation of multiband photography for rock discrimination.** G. L. Raines and K. Lee (Colorado School of

Mines, Golden, Colo.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 361-396. 8 refs. Grants No. NGL-06-001-015; No. DA-ARO(D)-31-124-71-G101; No. DA-ARO(D)-31-124-73-G88.

The ability of multiband photography to discriminate sedimentary rocks is investigated. Measurements showed that there is a large natural variation in the band reflectance of rock formations and that the differences in the contrast ratios for different Wratten filters is small, making it statistically impossible to select a set of best bands from in situ reflectance measurements. It is concluded that the designed multiband photography concept is not a practical method for improving sedimentary-rock discrimination capabilities. A.T.S.

A75-23770 Tectonic and geomorphological interpretations from a satellite photograph of Kutch-Aravalli region. B. N. Raina (Indian Photo-Interpretation Institute, Dehra Dun, India) and S. K. Sharma. In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 397-409.

A75-23771 * *Geologic information from satellite images.* K. Lee, D. H. Knepper, and D. L. Sawatzky (Colorado School of Mines, Golden, Colo.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 411-447. 6 refs. Grant No. NGL-06-001-015; Contracts No. NAS9-13394; No. NAS5-21778.

Extracting geologic information from ERTS and Skylab/EREP images is best done by a geologist trained in photo-interpretation. The information is at a regional scale, and three basic types are available: rock and soil, geologic structures, and landforms. Discrimination between alluvium and sedimentary or crystalline bedrock, and between units in thick sedimentary sequences is best, primarily because of topographic expression and vegetation differences. Discrimination between crystalline rock types is poor. Folds and fractures are the best displayed geologic features. They are recognizable by topographic expression, drainage patterns, and rock or vegetation tonal patterns. Landforms are easily discriminated by their familiar shapes and patterns. Several examples demonstrate the applicability of satellite images to tectonic analysis and petroleum and mineral exploration. (Author)

A75-24043 * A global magnetic anomaly map. R. D. Regan, W. M. Davis (U.S. Geological Survey, Reston, Va.), and J. C. Cain (NASA, Goddard Space Flight Survey, Greenbelt, Md.). *Journal of Geophysical Research*, vol. 80, Feb. 10, 1975, p. 794-802. 16 refs.

A subset of Pogo satellite magnetometer data has been formed that is suitable for analysis of crustal magnetic anomalies. Through the use of a thirteenth-order field model fit to these data, magnetic residuals have been calculated over the world to latitude limits of plus or minus 50 deg. These residuals, averaged over 1-degree latitude-longitude blocks, represent a detailed global magnetic anomaly map derived solely from satellite data. The occurrence of these anomalies on all individual satellite passes independent of local time and their decay as altitude increases imply a definite internal origin. Their wavelength structure and their correlation with known tectonic features further suggest that these anomalies are primarily of geologic origin and have their sources in the lithosphere. (Author)

A75-24668 Remote sensing of geologic hazards in Alabama. J. A. Drahovzal, C. C. Wielchowsky, J. L. G. Emplaincourt, W. M. Warren, and C. W. Copeland (Alabama, Geological Survey, University, Ala.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 12, 13. 15 refs.

Remotely sensed data collected about Alabama over the past 4 years is summarized. The data covers the following geologic hazards: (1) lineaments (long, linear surface features) related to fracturing and earthquake epicenters; (2) flood-prone areas; (3) sedimentation and erosion in coastal areas; and (4) subsidence in carbonate terranes caused by vegetative stress, water loss, or linear trends. S.J.M.

A75-27335 * # Geological applications of ERTS-1 and EREP /Skylab/ imagery to Utah and Nevada. M. L. Jensen (Utah, University, Salt Lake City, Utah). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, *Proceedings.* Tucson, University of Arizona, 1974, p. 133-135a. Contract No. NAS5-21883.

A75-27336 * # Quality and use of ERTS radiometric information in geologic applications. A. F. H. Goetz and F. C. Billingsley (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 136-147. 5 refs.

Some techniques are described for making full use of the data contained in an ERTS MSS image. Only about one-fourth of the data in a single band can be displayed at one time on a black and white image; therefore, when all four bands are considered, only about 7% of the available data can be used by the interpreter. Selecting the proper subset of information for the photointerpreter is therefore a necessity. Ratio methods exclude the brightness information from the display. A field study in one area using a portable spectrometer has shown only fair correlation with ERTS radiometry after one normalization procedure. Plots of brightness of test areas with sun angle show discrepancies. Plots of ratios show discrepancies of lesser magnitude, although the error limits are large. P.T.H.

A75-27337 # Structure and physiography of the Shivwits Plateau, Arizona. I. Lucchitta (U.S. Geological Survey, Flagstaff, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 148-152, 155-157. 6 refs.

The Shivwits Plateau has been mapped using conventional geological techniques and ERTS multispectral data. Principal results obtained from field investigations and photogeologic studies are presented. A geologic map and a fault and lineament map of the area are given. P.T.H.

A75-27339 # Automatic rose diagrams for rock mechanics and structural geology. W. L. Jacobsen, L. K. Lepley, and J. D. Gaskill (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 172-180. 8 refs.

The use of optical data processing methods for determining the azimuthal distribution of linear structural features such as joints, folds, faults, and bedding planes is briefly described. A photographic transparency containing linear features is placed in a collimated beam of coherent light derived from a laser. Each linear behaves as a diffraction grating, creating a Fraunhofer diffraction pattern at the focal plane. The Fraunhofer pattern, when rotated 90 degrees, is shown to be equivalent to a rose diagram. P.T.H.

A75-27340 * # Ratio techniques for geochemical remote sensing. R. K. Vincent (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 181-198. 19 refs. Contracts No. NAS5-21783; No. NAS9-13317.

The present work discusses spectral ratio methods for extracting information on the composition of minerals and rocks from 0.4-14-micron multispectral scanner data. Ratio images and automatic recognition maps based on spectral ratios have the advantages of covering nearly all wavelength regions of important geochemical information, being relatively insensitive to atmospheric and solar illumination variations, and having definable limits of accuracy concerning the capability of discriminating between important geochemical targets and background materials. P.T.H.

A75-28438 **The geology and geophysics of geothermal energy.** J. B. Combs (Texas, University, Dallas, Tex.). *Technology Review*, vol. 77, Mar.-Apr. 1975, p. 46-49.

Means of prospecting for geothermal resources are examined. In particular, such geophysical methods as electrical conductivity measurement are emphasized. Geothermal reservoirs tend to follow the contours of the continental plates. Some of the problems inherent in this type of energy source are indicated, and the application potential of the method is considered. S.J.M.

N75-16033*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, Nov. 1974
Monem Abdel-Gawad, Principal Investigator 30 Dec. 1974 2 p EREP
(Contract NAS9-14440)
(E75-10112; NASA-CR-141943; SC5007.1MR) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. S190-B imagery confirmed previous conclusions from S190-A that the Garlock fault does not extend eastward beyond its known termination near the southern end of Death Valley. In the Avawatz Mountains, California, two faults related to the Garlock fault zone (Mule Spring fault and Leach Spring fault) show evidence of recent activity. There is evidence that faulting related to Death Valley fault zone extends southeastward across the Old Dad Mountains. There, the Old Dad fault shows evidence of recent activity. A significant fault lineament has been identified from McCullough Range, California southeastward to Eagle Tail Mountains in southwestern Arizona. The lineament appears to control tertiary and possible cretaceous intrusives. Considerable right lateral shear is suspected to have taken place along parts of this lineament.

N75-16034*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, Dec. 1974
Monem Abdel-Gawad, Principal Investigator 31 Dec. 1974 2 p EREP
(Contract NAS9-14440)
(E75-10113; NASA-CR-141944; SC5007.3MR) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. A remarkable system of northwest and west-northwest trending faults was found to continue from eastern California into southwestern Arizona. The most significant is a fault belt which extends from west of Marble Mountains (southeastern California) across the Colorado River at Parker Valley towards Silver Bell Mountains, southern Arizona.

N75-16039*# Geological Survey, Reston, Va.
EVALUATION OF ERTS-1 DATA APPLICATIONS TO GEOLOGIC MAPPING, STRUCTURAL ANALYSIS AND MINERAL RESOURCE INVENTORY OF SOUTH AMERICA WITH SPECIAL EMPHASIS ON THE ANDES MOUNTAIN REGION Bimonthly Progress Report, 1 Nov. - 31 Dec. 1973
William D. Carter, Principal Investigator 2 Feb. 1974 10 p refs Repr. from Space Shuttle Payloads, v. 30, 1973 p 143-153 Sponsored by NASA ERTS
(E75-10118; NASA-CR-141953) Avail: NTIS HC $3.25 CSCL 08G

N75-16040*# Geological Survey, Reston, Va.
EVALUATION OF ERTS-1 DATA APPLICATIONS TO GEOLOGIC MAPPING, STRUCTURAL ANALYSIS AND MINERAL RESOURCE INVENTORY OF SOUTH AMERICA WITH SPECIAL EMPHASIS ON THE ANDES MOUNTAIN REGION Bimonthly Progress Report, 1 Sep. - 31 Oct. 1973
William D. Carter, Principal Investigator 28 Jan. 1974 4 p ERTS
(E75-10119; NASA-CR-141954) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. A color composite of image E1010-14035, dated 2 August 1972, covers the west central Bolivian Altiplano near Salar de Coipasa. It clearly shows the distribution of surface water and scant patches of vegetation. The Salar de Coipasa is the largest body of water in the area, about 130 sq km of dark blue fresh water. A lighter blue area south of the lake suggests a thin cover of highly saline water superposed on salt beds. The scattered vegetation patches are presumed to be native grasses, lichens, and possibly Indian potato and maiz areas. A detailed study has been made of the scene which provides 12 different interpretive overlays including geology, volcanology, soils, hydrology, and relative permeability. It was found that color composites provide at least 40% more information that do black and white renditions. An excellent example of change detection was provided by image E1244-14051, dated 24 March 1973. Water in the Salar de Coipasa had more than doubled as a result of the rains of the Bolivian winter, which generally occur in the February-March period. The Salars are excellent and highly sensitive moisture indicators in this highly arid region.

N75-16043*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Mineral Research Labs.
A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA Quarterly Report
N. H. Fisher and K. L. Burns, Principal Investigators 31 Jan. 1975 1 p Sponsored by NASA EREP
(E75-10122; NASA-CR-141976) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Preliminary results show that the high resolution imagery has, potentially, an operational role in geological surveying and the design of major engineering works, and is much more promising in this regard than the low resolution Skylab and ERTS-1 imagery.

N75-16045*# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA Quarterly Report, Nov. 1974 - Jan. 1975
N. H. Fisher, C. Maffi, C. J. Simpson, and W. J. Perry, Principal Investigators Jan. 1975 3 p Sponsored by NASA EREP
(E75-10124; NASA-CR-141978) Avail: NTIS HC $3.25 CSCL 05B

N75-16047*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report
Jack G. Quade, Principal Investigator [1975] 2 p EREP
(Contract NAS9-13274)
(E75-10126; NASA-CR-141979) Avail: NTIS HC $3.25 CSCL 08E

N75-16946 British Library Lending Div., Boston Spa (England).
WATER TEMPERATURE AND GEOLOGICAL FORECAST
V. Saks [1974] 3 p Transl. into ENGLISH from the Russian (BLL-M-23512-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The dependence between sea water temperature and O18 absorption by extinct marine organisms was used to determine the average annual sea water temperatures in seas that covered parts of Siberia about 100 to 150 million years ago. The obtained result of 15 to 20 C indicates the existence of all necessary conditions for the formation of oil and gas in the Siberian north, including the bottom of the Arctic Sea. G.G.

N75-16951*# Consiglio Nazionale delle Ricerche, Milan (Italy).
FRACTURES AND LINEAMENTS OF SICILY ISLAND: PRELIMINARY RESULTS ON ANALOG OPTICAL TECHNIQUES Progress Report
Roberto Cassinis, Principal Investigator and A. M. Tonelli 6 Dec. 1974 7 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E75-10132; NASA-CR-142052; PR-5) Avail: NTIS HC $3.25 CSCL 08E

N75-17755*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Sep. - Nov. 1973
George J. McMurtry, Principal Investigator Dec. 1973 4 p EREP
(Contract NAS9-13406)
(E75-10139; NASA-CR-142105) Avail: NTIS HC $3.25 CSCL 08H

N75-17757*# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Jan. - 31 Jan. 1975
Monem Abdel-Gawad, Principal Investigator 26 Feb. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10141; NASA-CR-142142) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Two alternate models for the extension of the Texas zone through the Mojave Desert block have been developed: (1) along the Pisgah Line, and (2) along the eastern Transverse Ranges; this model suggests a counterclockwise rotation of the Mojave block. Analysis of S190B photographs of the western Mojave Desert provides strong evidence for the feasibility of identifying recent fault breaks.

N75-17760*# California Earth Science Corp., Santa Monica.
INVESTIGATION OF LINEAMENTS ON SKYLAB AND ERTS IMAGES OF PENINSULAR RANGES, SOUTHWESTERN CALIFORNIA
P. M. Merifield, Principal Investigator and D. L. Lamar Dec. 1974 18 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contracts NAS2-7698; DI-14-08-0001-13911)
(E75-10144; NASA-CR-142145; TR-74-5) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Northwest trending faults such as the Elsinore and San Jacinto are prominently displayed on Skylab and ERTS images of the Peninsular Ranges, southern California. Northeast, north-south, and west-north-west trending lineaments and faults are also apparent on satellite imagery. Several of the lineaments represent previously unmapped faults. Other lineaments are due to erosion along foliation directions and sharp bends in basement rock contacts rather than faulting. The northeast trending Thing Valley fault appears to be offset by the south branch of the Elsinore fault near Agua Caliente Hot Springs. Larger horizontal displacement along the Elsinore fault further northwest may be distributed along several faults which branch from the Elsinore fault in the Peninsular Ranges. The northeast and west-northwest trending faults are truncated by the major northwest trending faults and appear to be restricted to basement terrane. Limited data on displacement direction suggests that the northeast and west-northwest trending faults formed in response to an earlier period of east-northeast, west-southwest crustal shortening. Such a stress system is consistent with the plate tectonic model of a subduction zone parallel to the continental margin suggested in the late Mesozoic and early Tertiary.

N75-17764*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Jan. 1972
Paul M. Merifield, Principal Investigator 5 Feb. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10148; NASA-CR-142149; MPR-20) Avail: NTIS HC $3.25 CSCL 08G

N75-17777# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
AIRBORNE RESISTIVITY MAPPING OF PERMAFROST NEAR FAIRBANKS, ALASKA
P. Hoekstra, P. V. Sellmann, and A. J. Delaney Sep. 1974 52 p refs
(DA Proj. 4A1-62121-A-894)
(AD-A000694; CRREL-RR-324) Avail: NTIS CSCL 08/12

Airborne resistivity methods using radio waves in three frequency bands were tested in the vicinity of Fairbanks, Alaska. The test sites were selected because much ground control is available for this area. The objectives of this study were to determine the ability of these methods to map permafrost and other soils and to investigate the advantages of multifrequency mapping. The airborne resistivity data obtained in this study were contoured and the contour maps were compared with surficial geological maps and other ground truth data available. The following conclusions were reached: (1) in areas where the near-surface sediments are relatively uniform, VLF resistivity best delineates permafrost; and (2) in areas where surface sediments vary widely (e.g., recent flood plains), resistivity at all frequencies gives little information on permafrost conditions, but provides other important information, such as bedrock type, depth to bedrock, soil type and layering. (Modified author abstract) GRA

N75-18663*# Iowa Univ., Iowa City. Dept. of Geology.
EXPERIMENT TO EVALUATE FEASIBILITY OF UTILIZING SKYLAB-EREP REMOTE SENSING DATA FOR TECTONIC ANALYSIS OF THE BIGHORN MOUNTAINS REGION, WYOMING-MONTANA Quarterly Progress Report, 1 Oct. - 31 Dec. 1974
Richard A. Hoppin, Alan L. Swenson, Principal Investigators, and James P. Caldwell 20 Feb. 1975 4 p EREP
(Contract NAS9-13313)
(E75-10151; NASA-CR-142201) Avail: NTIS HC $3.25 CSCL 08G

N75-18668# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL SURVEY OF THE LITTORAL SHELF USING SIDE-LOOKING SONAR
M. A. Spiridonov, Ye. A. Naumov, A. Ye. Rybalko, F. A. Alyavdin, and G. L. Eykhgorn 5 Feb. 1975 6 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (USSR), v. 219, no. 2, 1974 p 462-465
(JPRS-64039) Avail: NTIS HC $3.25

The use of side-looking sonar in the geological survey of the littoral shelf is described. Author

N75-18694*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOLOGICAL APPLICATIONS OF LANDSAT-1 IMAGERY TO THE GREAT SALT LAKE AREA
Arthur T. Anderson and Alan F. Smith (GE, Beltsville, Md.) Mar. 1975 15 p refs Submitted for publication
(NASA-TM-X-70846; X-923-75-45) Avail: NTIS HC $3.25 CSCL 08H

The ERTS program has been designed as a research and development tool to demonstrate that remote sensing from orbital altitudes is a feasible and practical approach to efficient management of earth resources. From this synoptic view and repetitive coverage provided by ERTS imagery of the Great Salt Lake area, large geological and structural features, trends, and patterns have been identified and mapped. A comparative analysis of lineaments observed in September and December data was conducted, existing mineral locations were plotted, and areas considered prospective for mineralization based on apparent structure-mineralization relationships were defined. The additional information obtained using ERTS data provides an added source of information to aid in the development of more effective mineral exploration programs. Author

N75-18713# Bureau of Mines, Pittsburgh, Pa. Eastern Field Operation Center.
THE RESERVE BASE OF BITUMINOUS COAL AND ANTHRACITE FOR UNDERGROUND MINING IN THE EASTERN UNITED STATES
Oct. 1974 432 p refs
(PB-237815/6; BM-IC-8655) Avail: NTIS MF $2.25; SOD HC $4.80 CSCL 08I

The Eastern United States coal reserve base is defined which has sufficient thickness for underground mining with a depth range compatible with economic recovery. The bituminous coal and anthracite reserve bases recoverable by underground mining methods are determined. The reserve data were compiled by the U.S. Bureau of Mines by updating and reevaluating previous estimates of the U.S. Geological Survey, State geological surveys, and others. Through the application of computer techniques the coal reserve base is compiled by State, County, and coalbed. Additional summations are made by rank. Coal reserves are allotted to sulfur categories by statistical apportionment of data from available Bureau of Mines reports and records. Excluding those coals of less than 28 inches in thickness to a depth of 1,000 feet, the deep-minable reserve base is estimated to be 168 billion tons as follows: 161 billion tons of bituminous coal and 7 billion tons of anthracite. Of this 28 billion tons contains 1.0 percent or less sulfur. Most of this is in the southern Appalachian area. GRA

N75-19778 Stanford Univ., Calif.
STATISTICAL ESTIMATION OF WILDCAT WELL OUTCOME PROBABILITIES BY VISUAL ANALYSIS OF STRUCTURE CONTOUR MAPS OF STAFFORD COUNTY, KANSAS Ph.D. Thesis
Alfredo Eduardo Prelat 1974 117 p
Avail: Univ. Microfilms Order No. 74-27084

The development of a method to estimate wildcat well outcome probabilities is described. The work involved analysis of a sequence of structure contour maps of three subsurface horizons (top of the Arbuckle Group, top of the Lansing Group, and top of the Stone Corral Formation) in a 24-by-24 mile area in northern Stafford County, Kansas. The principal technique employed is the so-called re-experience technique in which a succession of maps is prepared to represent the geology interpreted on the basis of different amounts of information. Each map prepared represents the interpreted subsurface structure based on information available at a particular time in the area's oil-field development history (as for example, at the end of 1940). Geologic data from all wildcat wells and selected infield wells that had been drilled prior to the date of the map were used in preparation of the map, but no geologic information from wells drilled after the date of a particular map was used. Dissert. Abstr.

N75-19781*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Jan. - Feb. 1975
Keenan Lee, Principal Investigator 7 Mar. 1975 7 p EREP
(Contract NAS9-13394)
(E75-10157; NASA-CR-142181) Avail: NTIS HC $3.25 CSCL 08F

N75-19783*# North Carolina State Univ., Raleigh. School of Physical and Mathematical Sciences.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Dec. 1974 - Feb. 1975
Charles W. Welby, Principal Investigator 6 Mar. 1975 7 p EREP
(Contract NAS9-13321)
(E75-10159; NASA-CR-142183) Avail: NTIS HC $3.25 CSCL 08G

N75-19784*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Mar. 1975
Jack G. Quade, Principal Investigator 20 Mar. 1975 2 p EREP
(Contract NAS9-13274)
(E75-10160; NASA-CR-142209) Avail: NTIS HC $3.25 CSCL 08E

N75-19791*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Feb. - 28 Feb. 1975
Monem Abdel-Gawad, Principal Investigator 24 Mar. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10167; NASA-CR-142216; SC5007.8MR) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Although the enlargements made from the EREP image have an inferior resolution relative to the unenlarged U-2 images, we were able to recognize geomorphologic features associated with recent fault breaks. Author

N75-19797*# South Carolina State Development Board, Columbia. Div. of Geology.
APPLICATION OF MULTISPECTRAL PHOTOGRAPHY TO MINERAL AND LAND RESOURCES OF SOUTH CAROLINA Quarterly Progress Report
Norman K. Olson, Principal Investigator 5 Mar. 1975 38 p refs
(Contract NAS8-29617)
(E75-10173; NASA-CR-142222; QPR-4; QPR-5) Avail: NTIS HC $3.75 CSCL 08G

N75-19799*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Feb. 1975
Paul M. Merifield, Principal Investigator 5 Mar. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10175; NASA-CR-142224; MPR-21) Avail: NTIS HC $3.25 CSCL 08E

N75-19806# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

[FIELD OPERATIONS AND LABORATORY STUDIES ON MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS IN AUSTRALIA] Annual Report, 1973
1974 106 p refs
Avail: NTIS HC $5.25

The principal activities of the Bureau of Mineral Resources are reported. Major areas studied include the following: geological mapping; aeromagnetic and radiometric surveys; seismicity of Australia and New Guinea; Landsat 1 and Skylab imagery; and marine geology. J.M.S.

N75-20807# Lund Univ. (Sweden). Dept. of Hydraulics.
LINEAR ANALYSIS OF GROUNDWATER LEVEL RESPONSE ON CLIMATIC INPUT FOR DIFFERENT GEOLOGICAL ENVIRONMENTS
L. Gottschalk, M. Lindeberg, and L. Nordberg (Geol. Surv. of Swed.) Stockholm Swed. Natl. Comm. for Intern. Hydrol. Decade Sep. 1974 60 p refs Sponsored by Swed. Natl. Comm. for Intern. Hydrol. Decade
(Rept-40) Avail: NTIS

The behavior of ground water fluctuations is governed by the variations in climatic conditions as well as the specific geological environment. To find the specific geological characteristics of ground water level time series, a model is described which filters out these characteristics from series of climatic and ground water level observations. The climatic fluctuations are assumed to be described by the variations in rainfall, snowmelt and evapotranspiration. ESRO

05

OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

A75-21514 **On the components of spatial spectrum of a radar signal scattered by the surface of the sea.** A. A. Zagorodnikov. *(Radiotekhnika i Elektronika,* vol. 19, Feb. 1974, p. 419-421.) *Radio Engineering and Electronic Physics,* vol. 19, Feb. 1974, p. 119-121. 12 refs. Translation.

Analysis of the spectrum of the envelope of a radar signal which represents the spatial characteristics of an underlying sea surface. It is shown that the reflecting surface of the sea can be represented in the form of a set of independent random reflectors, as a result of which the spectral density of the fine ripples (which cause centimeter range signal reflection) on the slopes of the large waves can be neglected in calculations of the spatial characteristics of the signal. A.B.K.

A75-23328 **Seabed assessment, resource geology and their relation to marine geodesy.** E. M. Davin (National Science Foundation, Office for the International Decade of Ocean Exploration, Washington, D.C.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 49-52.

A major goal of the International Decade of Ocean Exploration (IDOE) programs is to expand Seabed Assessment activities to permit better management of marine mineral exploration and exploitation by acquiring needed knowledge of the dynamic processes of the ocean floor and continental margins. Studies of the continental margins of South America and Africa are now underway. The processes operative at mid-oceanic ridges and deep trenches are being investigated on the Nazca Plate and the Mid-Atlantic Ridge. The mineral resources of the ocean floor, especially manganese nodules, are the subject of several studies. Satellite navigation reduced the uncertainty in surveying methods to hundreds of meters. Increased pressure for exploitation of the seafloor will require a precision location methods with uncertainties of a few meters or less. (Author)

A75-23329 * **SEASAT-A - A user oriented systems design.** S. W. McCandless, Jr. (NASA, Washington, D.C.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 67-74.

The SEASAT-A spacecraft is tentatively scheduled for launch in 1978 into a nearly circular orbit with an altitude of approximately 800 km. The spacecraft is to demonstrate a capability for the global monitoring of wave height and spectra, surface winds, ocean temperature, and current patterns. Other objectives include the charting of ice fields and a mapping of the global geoid. The sensors to be carried by the spacecraft are discussed and a description is given of the satellite system and the subsystems. G.R.

A75-23337 * **Bistatic sea state radar monitoring system and applications to marine geodesy.** G. T. Ruck (Battelle Columbus Laboratories, Columbus, Ohio). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 237-249. 9 refs. Contract No. NAS6-2006.

The bistatic scattering of high frequency radio waves can be used to observe directional ocean-wave spectra. This makes it possible to measure RMS wave heights. An experimental aircraft system for such measurements is discussed. The system utilizes a surface transmitter and an airborne receiver. Questions of high frequency scattering from the ocean surface are considered along with surface spectrum measurements. G.R.

A75-23338 * **Marine geodesy - Problem areas and solution concepts.** N. Saxena (Ohio State University, Columbus, Ohio). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 257-267. 23 refs. Grant No. NGR-36-008-093.

This paper deals with a conceptional geodetic approach to solve various oceanic problems, such as submersible navigation under iced seas, demarcation/determination of boundaries in open ocean, resolving sea-level slope discrepancy, improving tsunami warning system, ecology, etc. The required instrumentation is not described here. The achieved as well as desired positional accuracy estimates in open ocean for various tasks are also given. (Author)

A75-23340 **Geoid definitions for the study of sea surface topography from satellite altimetry.** R. S. Mather (New South Wales, University, Sydney, Australia). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 279-289. 20 refs.

This paper concentrates on the development of techniques for obtaining geoid definitions from mixed data sets consisting of oceanic 'geoid heights' deduced from the altimetry, and gravity anomalies largely in continental areas, from solutions of the geodetic boundary value problem. It discusses how data subject to significant systematic errors with substantial wavelengths can be successfully used in the quadratures evaluation of such solutions. Arguments are outlined for the incorporation of gravity field models with errors at the 5% level in the disturbing potential, in the system of geodetic reference. The adoption of such a procedure would permit a common model to be used both in the solution of the boundary value problem, as well as in orbit determination, on reinforcement with the appropriate resonant terms. The advantage of quadratures methods in high-precision determinations lies in the elimination of prohibitive matrix inversion problems, provided conditions for convergence can be established by appropriate modification of the data acquisition procedures. (Author)

A75-23343 **Geoid determination from satellite altimetry using sample functions.** R. D. Brown (Computer Sciences Corp., Los Angeles, Calif.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 315-329. 10 refs.

For implementation of the sample function geopotential model, Lundquist and Giacaglia (1969) proposed an algorithm, involving the assumption of a diagonal normal matrix. Another, simpler, algorithm was proposed by Giacaglia and Lundquist (1972) in order to reduce the amount of computational work required in using the first algorithm. The procedure to be used in numerical simulations of these two algorithms as applied to the altimeter problem is discussed along with the results of numerical simulation tests using both algorithms. G.R.

A75-23346 * **Detailed gravimetric geoid for the GEOS-C altimeter calibration area.** J. G. Marsh (NASA, Goddard Space Flight Center, Greenbelt, Md.) and S. Vincent (Computer Sciences Corp., Silver Spring, Md.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 371-379. 6 refs.

The GEOS-C spacecraft scheduled for launch in late 1974 will carry a radar altimeter for the purpose of measuring sea surface

topography. In order to calibrate and evaluate the performance of the altimeter system, ground truth data are required. In this respect a detailed gravimetric geoid has been computed for the GEOS-C altimeter calibration area in the Atlantic Ocean off the East Coast of the U.S. This geoid is based upon a combination of mean free air surface gravity anomalies and the Goddard Space Flight Center GEM-6 satellite-derived spherical harmonic coefficients. Surface gravity anomalies have been used to provide information on the short wave length undulations of the geoid while the satellite-derived coefficients have provided information on the long wave length components. As part of these analyses, GSFC, SAO and OSU satellite-derived gravity models were used in the computations. Although geoid heights based upon the various satellite models differed by as much as 30 meters in the Southern Hemisphere, the differences in this Atlantic Ocean area were less than 4 meters. (Author)

A75-23347 Operational reliability of a conventional satellite navigation system in Beaufort Sea gravity studies. E. F. Chiburis (Marine Sciences Institute, Groton, Conn.) and P. Dehlinger (Connecticut, University, Groton, Conn.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 409-416. Contract No. N00014-68-A-0197-002.

In conjunction with surface-ship gravity studies conducted in the Beaufort Sea, an analysis was made of ship positions obtained with a conventional satellite navigation system aboard a USCG icebreaker operating on the continental margin north of Alaska. Every possible fix was obtained during 1972 and 1973 field seasons to permit the calculation of accurate corrections to gravity measurements. Analyses were made of gravity anomaly misties at trackline intersections and of satellite fixes, indicating that routinely obtained navigation data are sufficient to determine anomalies within a one milligal uncertainty. (Author)

A75-23688 Observations of oceanic internal and surface waves from the Earth Resources Technology Satellite. J. R. Apel, H. M. Byrne, J. R. Proni, and R. L. Charnell (NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, Fla.). *Journal of Geophysical Research,* vol. 80, Feb. 20, 1975, p. 865-881. 14 refs. ARPA-supported research.

Periodic features observed on the ocean surface from the Earth Resources Technology Satellite 1 have been interpreted as surface slicks due to internal wave packets. They appear to be generated at the edge of the continental shelf by semidiurnal and diurnal tidal actions and propagate shoreward. Nonlinear effects apparently distort the wave packets as they progress across the shelf. This observational technique constitutes a new tool for delineating two dimensions of the internal wave field under certain limited conditions. (Author)

A75-23756 Airborne radiometric measurement of land and sea surface temperatures. T. A. Hariharan (Indian Space Research Organization, Space Applications Centre, Ahmedabad, India). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 161-172.

Some preliminary results of airborne radiometric measurement of temperature over land and sea surfaces obtained with an infrared line scanner are described. Over sea, areas with features of anomalous temperature distribution were noticeable. Measurements made from four different altitudes over the same area indicate the atmospheric effects in the 10-12 micron window region. Predawn measurements over land seems to indicate anomalous temperature distributions in areas suspected to have weak geothermal manifestations. (Author)

A75-24088 Remote sensing of the sea surface from satellites (Fernerkundung der Meeresoberfläche von Satelliten aus). W. Alpers, K. Hasselmann, and M. Schieler (Hamburg, Universität, Hamburg, West Germany). *Raumfahrtforschung,* vol. 19, Jan.-Feb. 1975, p. 1-7. 21 refs. In German.

Remote sensing techniques for satellite-borne measurements of the sea surface are reviewed briefly. Three methods for determining significant parameters of ocean wave spectra using microwaves are discussed in detail: the nanosecond-pulse radar altimeter, the two-frequency radar interferometer for rms wave height measurement, and the off-nadir looking two frequency radar. The last technique seems to be very promising for measuring the complete two-dimensional ocean wave spectrum from satellites. (Author)

A75-24675 Measurement of sea state using the statistical properties of backscattered returns from a pulse compression radar. D. L. Schuler (U.S. Navy, Naval Research Laboratory, Washington, D.C.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 68, 69. 5 refs.

An experimentally tested technique is described which allows measurement of the backscatter cross-section, sigma, of the sea dynamically with an accuracy commensurate with a very long integration time. The study reported utilizes the independent returns, or degrees of freedom, that are present when a frequency-modulated, large time-bandwidth (TBW) signal is scattered from the sea. In particular, a pulse compression radar is used which has a TBW product K, equal to the pulse compression ratio. Results indicate that radar scatterometry using a large time-bandwidth FM signal is efficient in rapid sea surface scanning to determine sea state. S.J.M.

A75-26543 * Imaging and sounding of ice fields with airborne coherent radars. C. Elachi and W. E. Brown, Jr. (California Institute of Technology, Jet Propulsion Laboratory, Space Sciences Div., Pasadena, Calif.). *Journal of Geophysical Research,* vol. 80, Mar. 10, 1975, p. 1113-1119. 14 refs. Contract No. NAS7-100.

A75-26869 # Study of terrestrial and oceanic tides from perturbations of satellite orbits (Etude des marées terrestres et oceaniques à partir des perturbations d'orbites de satellites). A. Cazenave (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France). *(Convegno Internazionale sulla Rotazione della Terra e Osservazioni di Satelliti Artificiali, Cagliari, Italy, Apr. 16-18, 1973.) Cagliari, Università, Facoltà di Scienze, Seminario, Rendiconti,* vol. 44, Supplement, 1974, p. 25-29. 37 refs. In French.

It is demonstrated that by ignoring oceanic tides in calculating the Love number k2 from perturbations of satellite orbits, an error of one order of magnitude is introduced. That is, ocean tides account for as much as 10-15 percent of those perturbations, the rest being due to solid terrestrial tides. Atmospheric tides are also considered, but they prove to be insignificant. Assuming solid earth tidal variations are known, it is conceivable that ocean tides may be empirically determined from satellite perturbations in the future. S.J.M.

A75-27114 Potential of satellite radar altimetry for determination of the short wavelength geoidal undulations. A. Shapiro and B. S. Yaplee (U.S. Navy, E. O. Hulburt Center for Space Research, Washington, D.C.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 481-508.

Principles of satellite altimeter operations are considered, taking into account aspects of satellite altimeter geometry, the sea surface reflection mechanism, satellite altimeter performance constraints, the radar amplitude SNR, the intrinsic SNR, range SNR, and potential altimeter performance. Environmental effects are also investigated,

giving attention to satellite effects, sea surface effects, and atmospheric effects. G.R.

A75-27115 Determination of oceanic geoid from short arc reduction of satellite altimetry. D. C. Brown (DBA Systems, Inc., Melbourne, Fla.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 509-522. Contract No. F19628-72-C-0085.

An investigation was made to determine whether extremely high orbital accuracies are inherently essential to the effective utilization of satellite altimetry for geoidal improvement. A short-arc approach is described in which weakly constrained orbital state vectors defining as many as several thousand short arcs (1/6 to 1/8 revolution in length) are recovered simultaneously with the parameters necessary to defining the geoidal surface. Computer simulations demonstrate the feasibility and accuracy of the short-arc method. An oceanic geoid having an rms accuracy of 1-2 m can be produced from the reduction of data from observations of the Geos-C satellite. The short-arc approach does not depend on establishing a highly accurate reference orbit and, thus, places only minimal requirements on satellite tracking by external systems. A.T.S.

A75-27343 # Oceanographic studies of the northern Gulf of California. L. K. Lepley, J. P. Hendrickson, C. Flanagan (Arizona, University, Tucson, Ariz.), and G. Calderon (Secretariat de Marina, Mexico). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 227-258. 12 refs.

Analysis of ERTS imagery of the northern Gulf of California with the aid of surface truth sampling of physical oceanographic parameters is described. Oceanographic and meteorological data obtained by surface observations are discussed, and a seasonal circulation model is constructed for the Gulf waters. ERTS imagery in all four MSS bands is used to evaluate the circulation model, and is analyzed to predict the depth of turbidity patterns, to obtain spectral models of mixed water bodies and glitter patterns, and to observe gyres, upwelling plumes, internal waves, the tidal current velocity, tidal phases, fresh water runoff, and other phenomena. The circulation model is revised on the basis of the satellite imagery data. Suggestions for further studies are made, and charts and ERTS photographs are appended. F.G.M.

A75-28524 # Satellite detection of upwelling in the Gulf of Tehuantepec, Mexico. H. G. Stumpf (NOAA, National Environmental Satellite Service, Suitland, Md.). *Journal of Physical Oceanography*, vol. 5, Apr. 1975, p. 383-388.

The daily acquisition of thermal infrared imagery from the NOAA-2 satellite permitted the delineation and monitoring of a series of upwellings in the Gulf of Tehuantepec during December 1973. Following the upwelling, a large anticyclonic gyre was detected in the imagery as the coastal currents returned to their historical positions. (Author)

A75-28589 * Use of APT satellite infrared data in oceanographic survey operations. P. E. LaViolette (U.S. Navy, Naval Oceanographic Office, Washington, D.C.), L. Stuart, Jr., and C. Vermillion (NASA, Goddard Space Flight Center, Greenbelt, Md.). *EOS*, vol. 56, May 1975, p. 276-282. 12 refs. Navy-NASA-sponsored research.

Experiments are described which were conducted to explore and develop the application of satellite infrared data to oceanographic post survey data analysis. The use of satellite infrared and visible radiation data in oceanographic surveys is examined. V.P.

A75-28599 # The oceanic biomass energy plantation. H. A. Wilcox (U.S. Navy, Naval Undersea Center, San Diego, Calif.). *American Institute of Aeronautics and Astronautics and American Astronautical Society, Solar Energy for Earth Conference, Los Angeles, Calif., Apr. 21-24, 1975, AIAA Paper 75-635.* 8 p. 46 refs. NSF-sponsored research.

The Ocean Energy Farm Project is designed to explore and develop the technical and economic ability to raise large quantities of vegetation on artificial substrates (meshes made of plastic lines) in the surface waters of the tropical and temperate oceans. The first crop species under development is the giant California kelp, Macrocystis pyrifera. The project is a three-phase, 11- to 15-year effort to result in a 100,000-acre farm system in the Atlantic or Pacific by the 1985-to-1990 time period. This system is projected to produce foods, fuels, fertilizers, plastics, and other products for man's consumption at a rate sufficient to supply all the requirements for two to three persons per acre of cultivated ocean at today's world average consumption levels. The productivity of the system is based on bringing the nutrients of the deep waters by means of wave-powered upwelling devices into contact with the solar energy of the surface waters. The project used a 7-acre experimental farm off the northern tip of San Clemente Island, California. (Author)

A75-28605 Near-simultaneous observations of intermittent internal waves on the continental shelf from ship and spacecraft. J. R. Apel, J. R. Proni, H. M. Byrne, and R. L. Sellers (NOAA, Ocean Remote Sensing Laboratory, Miami, Fla.). *Geophysical Research Letters*, vol. 2, Apr. 1975, p. 128-131. ARPA-supported research.

Internal waves on the continental shelf off New York have been observed from ship and the ERTS-1 spacecraft, and positive correlations made between surface and subsurface measurements of temperature, acoustic volume reflectivity, and surface slicks. The spacecraft imagery senses the quasi-periodic variations in surface optical reflectivity induced by the internal waves. The waves appear to be tidally generated at the shelf edge and occur intermittently in packets, which propagate shoreward and disappear in water near 50-m depth. (Author)

A75-28905 Measurement of sea state by RF interferometry. R. K. Thomas (General Electric Co., Philadelphia, Pa.) and H. N. Kritikos (Pennsylvania, University, Philadelphia, Pa.). *IEEE Transactions on Geoscience Electronics*, vol. GE-13, Apr. 1975, p. 73-80. 10 refs.

The mutual coherence function is derived for the scattered field due to a plane wave incident on the surface of the sea. The analysis is based on first order small perturbation theory, and neglects composite surface effects. The concept of an interferometer measuring the space correlation function of the scattered field providing information leading to the determination of the wave number spectrum of the sea surface is demonstrated. Assuming that the sea has a Phillips spectrum with a low cutoff number determined by the wind, a number of the basic physical properties of the proposed device are examined. (Author)

N76-16204# Nova Univ., Dania, Fla. Physical Oceanographic Lab.

DEVELOPMENT OF A SYSTEM FOR MEASUREMENT OF SURFACE CURRENTS AND OCEANIC CURRENT OBSERVATIONS Final Report, Oct. 1971 - Jan. 1974

William S. Richardson Feb. 1974 94 p refs

(Contract DOT-DG-20859-A)

(AD-787787; USCG-D-18-75; CGR/DC-1/74) Avail: NTIS CSCL 08/3

The report contains a description of modifications and improvements to expendable probes for the measurement of oceanic currents from aircraft. These probes were used in the study of currents along eleven sections on the southeast coast of Florida. The results of the study are presented. A manual for the operational use of the probe was prepared.

Author (GRA)

N75-16428* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EARTH AND OCEAN PHYSICS
In its Significant Accomplishments in Sci. and Technol. 1975 p 234-249
CSCL 08J

A procedure for obtaining a parameterization of the marine geoid for suitable orthogonality properties in altimetry data is discussed. The application of the technique to the Puerto Rico trench is explained and a map of the data is developed. The Goddard Earth Model (GEM-6) is described to show the method for determining the earth gravity field using data obtained from satellite tracking stations. The deviation of a global ocean tide model from satellite data is explained. The influence of solid earth and ocean tides on the inclination of GEOS-1 is plotted. The delineation of the geographical fracture pattern and boundary system of the tectonic plates using ERTS satellite is shown.
P.N.F.

N75-17052# National Environmental Satellite Service, Washington, D.C.
POTENTIAL VALUE OF EARTH SATELLITE MEASUREMENTS TO OCEANOGRAPHIC RESEARCH IN THE SOUTHERN OCEAN
E. Paul McClain Jan. 1975 23 p refs
(NOAA-TM-NESS-61) Avail: NTIS HC $3.25

Methods to improve the mapping and monitoring of icepack concentration, character, and condition from satellite observations in the visible, near infrared, and thermal infrared parts of the spectrum are reviewed along with techniques developed to map sea surface temperatures and temperature gradients on regional and hemispheric scales from space. Examples of NOAA and ERTS *measurements, higher in spectral and spatial resolution* than those previously available, and of measurements from the passive microwave imager aboard Nimbus 5 and their applications are presented. A brief discussion of future sensor systems expected to be of interest to Southern Ocean researchers is given.
Author

N75-17759*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report
George A. Maul, Principal Investigator Jan. 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10143; NASA-CR-142144) Avail: NTIS HC $3.25 CSCL 08C

N75-17762*# Science Applications, Inc., Ann Arbor, Mich.
USE OF SKYLAB EREP DATA IN A SEA SURFACE TEMPERATURE EXPERIMENT Interim Report
David C. Anding, Principal Investigator and John P. Walker Mar. 1975 19 p EREP
(Contract NAS9-13277)
(E75-10146; NASA-CR-142147; JRB-75-201-AA) Avail: NTIS HC $3.25 CSCL 08J

N75-18458*# Maryland Univ., College Park. Dept. of Electrical Engineering.
RADAR OPTIMIZATION FOR SEA SURFACE AND GEODETIC MEASUREMENTS Final Report
Robert O. Harger 1974 59 p refs
(Grant NGR-21-002-433)
(NASA-CR-136765) Avail: NTIS HC $4.25 CSCL 17I

The efficient estimation of geoid and sea state parameters is discussed, and the optimum processing structures, including maximum likelihood estimators, and their accuracy limits are given for a model. The model accounts for random surface reflectivity, sea height, and additive noise, and allows for arbitrary radar system parameters, based on the assumption the received signal is a sample function of a normal random process. The integral equation associated with the Gaussian signal in Gaussian noise inference problem was solved. It is shown that the optimum processing is generally a mixture of coherent and incoherent integrations which may be viewed as a weighted summation of received power of the match-filtered received data. When estimates are correlated, the strongest correlation appears between geoid and asymmetry estimates, and between wave height standard deviation and reflectivity estimates.
Author

N75-18708# Environmental Research Inst. of Michigan, Ann Arbor.
BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS Quarterly Report, 15 Jul. - 15 Oct. 1974
Frederick J. Thomson 15 Oct. 1974 29 p refs
(Contract N00014-74-C-2073; NR Proj. 389-166)
(AD-A001090; ERIM-108900-2-L) Avail: NTIS CSCL 08/6

This is the second quarterly report under the contract for development of remote sensing methods for monitoring of coastal areas. Work on this contract is divided into three tasks: (1) Compositional mapping of beaches and river systems; (2) enhancement and location of bottom features with passive multispectral data; and, (3) multispectral radar imaging for coastal areas.
GRA

N75-18864# Environmental Research and Technology, Inc., Lexington, Mass.
OCEANOGRAPHIC STUDIES USING SATELLITE DATA: DETECTION OF NEAR SHORE PHENOMENA IN ERTS IMAGERY Final Report, Jun. - Dec. 1973
Clinton J. Bowley and James C. Barnes Jan. 1974 99 p
(Contract N66314-73-C-1749)
(AD-A001300; ERT-P-532-1; EPRF-TR-1-74) Avail: NTIS CSCL 08/10

The detection of near-shore phenomena in the ERTS-1 four-channel, multispectral scanner (MSS) imagery was investigated. Selected imagery containing near-shore patterns in several geographical locations are catalogued with documentation of the types of phenomena detected.
GRA

N75-18865# Environmental Research and Technology, Inc., Lexington, Mass.
MAPPING OF SEA SURFACE TEMPERATURE BY THE NOAA-2 SATELLITE Final Report
James L. Cogan and James H. Willand May 1974 75 p refs
(Contract N66314-73-C-1749)
(AD-A001092; ERT-Doc-0532-2; EPRF-TR-6-74(ERT)) Avail: NTIS CSCL 08/10

The results of this study show that sea surface temperature (T sub s) may be inferred from satellite measurements of infrared radiances to an accuracy of plus or minus 1K up to about 500 km from the sub-satellite track if data on atmospheric variables, especially water vapor, are available. In the absence of all information on atmospheric parameters T sub s may still be estimated to about plus or minus 2K; a similar accuracy is attained if only climatological atmospheric data are available.
GRA

N75-19801# Canada Centre for Remote Sensing, Ottawa (Ontario). Program Planning and Evaluation.
BENEFITS OF REMOTE SENSING OF SEA ICE
A. K. McQuillan and Donald J. Clogh (Univ. of Waterloo) Dec. 1973 32 p refs Supersedes Ref-73-20
(RR-73-3; Ref-73-20) Avail: NTIS HC $3.75 CSCL 08L

A preliminary analysis of the benefits and costs of remote sensing of sea ice in the Arctic, the Gulf of St. Lawrence and the East Coast Offshore is presented.
Author

N75-19817# Naval Oceanographic Office, Washington, D.C.
PRELIMINARY RESULTS OF LITTLE WINDOW 2: A SATELLITE OCEAN STATION EXPERIMENT IN THE GULF OF CALIFORNIA Final Report
Paul E. Laviolette, ed. Apr. 1974 100 p refs Presented at an Interagency Conf. held in Apr. 1972
(AD-A002457; NOO-SP-261) Avail: NTIS CSCL 08/10

In May 1971, a joint United States-Mexican experiment was

conducted in a 200-by-200-km square in the Gulf of California to compare NOAA 1 satellite equivalent blackbody temperatures (TBB) from the NOAA 1 satellite with similar data collected by research vessels and aircraft. This experiment - LITTLE WINDOW 2 - was performed to determine the utility of satellite TBB sensors to define sea surface temperature features from space. Three specially equipped research aircraft and two survey vessels repeatedly ran oceanographic transects of the Gulf, while three Mexican naval vessels simultaneously occupied anchor stations at three corners of the LITTLE WINDOW 2 area. Report covers meteorological and oceanographic conditions, aircraft data analysis, and analyses of satellite data. GRA

N75-20682*# Battelle Columbus Labs., Ohio.
BISTATIC RADAR SEA STATE MONITORING SYSTEM DESIGN
G. T. Ruck, C. K. Krichbaum, and J. O. Everly Mar. 1975 104 p
(Contract NAS6-2006)
(NASA-CR-141393) Avail: NTIS HC $5.25 CSCL 17I

Remote measurement of the two-dimensional surface wave height spectrum of the ocean by the use of bistatic radar techniques was examined. Potential feasibility and experimental verification by field experiment are suggested. The required experimental hardware is defined along with the designing, assembling, and testing of several required experimental hardware components. Author

06

HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

A75-22532 * # **Improvement of water resources management through the use of satellites flood plain delineation.** P. A. Castruccio (Ecosystems International, Inc., Gambrills, Md.) and A. Rango (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 99-132. 19 refs.

The delineation of flood-prone areas is an important activity in several parts of the world. Conventional methods map the topography surrounding the river via ground surveys and supplementary aerophotography. The conventional method costs approximately $2,000 per river-kilometer, is laborious and time-consuming. ERTS information can supplement this method by two complementary techniques: (1) the dynamic method images the floods as they occur, exploiting the fact that visible evidence of inundation remains for a substantial period after the high waters have receded; (2) the static method utilizes the fact that several flood plains have been found recognizable on ERTS imagery from distinctive, permanent indicators left by previous floods. For areas whose full development is still in the future, the dynamic method allows the gradual buildup with time of a flood plain map, by simply correlating existing ERTS imagery. The static method allows in several areas, a first-cut indication, of proneness to floods. (Author)

A75-22533 # **Hydrogeologic evaluation of ERTS and EREP DATA for the Pampa of Argentina.** W. Kruck (Federal Geological Survey, Hanover, West Germany). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 134-139.

A75-22534 # **Dynamical behaviour of the surface water of Lagoa dos Patos, Brazil.** R. Herz (São Paulo, Universidade, São Paulo; Instituto de Pesquisas Espaciais, São José dos Campos, Brazil) and W. Tavares, Jr. (São Paulo, Universidade, São Paulo, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 140-157. 13 refs.

The coastal province of Rio Grande do Sul, Brazil, has a very complex hydrographic structure where Patos lagoon is the largest fresh water surface. Seasonal characteristics of the hydrological regime cause different contrast on the ERTS-1 orbital images by the suspended matter from which we can interpret the surface water distribution patterns. Morphological, meteorological and hydrological variables will be considered in each period simultaneously with a theoretical mathematical model and satellite images, in an attempt to discover the circulation of surface waters inside the lagoon. The proposal of a circulation model will contribute greatly to the understanding of the Quaternary processes in the south Brazilian coastal region. (Author)

A75-22535 # **Study of the surface boundary of the Brazil and Falkland currents.** Y. C. Tseng (Instituto de Pesquisas Espaciais, São José dos Campos, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 160-173. 14 refs.

Thirty cloud-free images of Nimbus IV THIR (11.5 micron channel), at the boundary of the Brazil and Falkland currents, were interpreted, to study its movements in 1970-1971. A division of the area according to the order of magnitude of its displacements, in 9 out of 30 images studied, was done. One hundred nm (nautical miles), 200 nm and more than 300 nm in the northern, central and southern regions respectively, resulted. The mean boundary was also calculated and mapped. Seasonal changes showed that the fluctuations of the boundaries in spring, were several orders of magnitude larger than the ones occurred in the early periods of the four seasons. Its maximum extension, 1200 nm, occurred in early spring and its minimum, 500 nm, in early summer. Comparing its positions in the four early periods of the seasons, it was found that it tends to stay more oceanic. In early and mid-spring it approaches the coast, when it reaches the coastal waters in the first of these two periods. (Author)

A75-22536 # **Use of ERTS-1 images in coastal studies in Guanabara Bay and adjacent waters.** A. S. Mascarenhas, Jr. (São Paulo, Universidade, São Paulo; Instituto de Pesquisas Espaciais, São José dos Campos, Brazil) and K. Tanaka (Instituto de Pesquisas Espaciais, São José dos Campos, Brazil). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 174-186. 7 refs.

A preliminary study of six images of ERTS-1 taken by the Multispectral Scanner (MSS) over Guanabara Bay, in Brazil, is presented. Spreading of sediments and displacements of pollution plumes, shown by the images in bands 4 and 5, are correlated with oceanographic and meteorological data, in order to describe the nature and extension of these plumes. Inside the bay, the currents are mainly determined by the tides and outside it, by the winds. Organic pollution could be seen in channels 4 and 5 inside the bay. Sewage in Vidigal Inlet could be seen in channel 4. Outside the bay using density slicing technique with the ERTS-1 image of Feb. 16, 1973, sewage pollution was seen more clearly than in the interior of it. An attempt was also made to classify the water masses into the bay. Besides, spectral properties in one station in the bay were measured with an ISCO spectroradiometer Model SR. (Author)

A75-23752 **ERTS study of ancient river gravels of Sierra Nevada.** M. Abdel-Gawad and L. Tubbesing (Rockwell International Science Center, Thousand Oaks, Calif.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 93-106. 7 refs.

ERTS-1 imagery of the Sierra Nevada Range reveals distinct areas of high albedo signatures that correspond to known occurrences of auriferrous gravels and overlying volcanic tuffs that mark the courses of an extinct system of rivers and their tributaries which crossed the region from west to east during the Tertiary period. The imagery also shows many additional occurrences where Tertiary gravels had not been mapped. The high albedo signature is particularly enhanced in devegetated areas of hydraulic gold mining. V.P.

A75-23753 * **Ice growth in Duluth harbor and western Lake Superior.** M. Sydor (Minnesota, University, Duluth, Minn.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 107-116. Grant No. NGL-24-005-263.

Ice growth computation for the Duluth-Superior harbor and the adjacent Lake Superior waters, using the heat budget balance, agrees

well with the measured ice values for the 1972-73 winter season. ERTS data is used for the determination of ice albedo and the resulting ice decay rate on Lake Superior. During the period of ice packing near Duluth, the calculated ice decay rates, combined with the ERTS data on the extent and the condition of the ice field indicate maximum ice packing between March 20-27, when the packed ice field, exhibiting albedo values above 70% reached an average 60 cm thickness. The results offer a method for description of ice packing which could be used for ice forecasting on Lake Superior if more frequent ERTS images were available. (Author)

A75-23755 Applicability of remote sensing to river basin control programs. L. S. Leonhart (Arizona, University, Tucson, Ariz.; U.S. Environmental Protection Agency, Washington, D.C.) and L. G. Everett (Arizona, University, Tucson, Ariz.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974.
Tullahoma, University of Tennessee, 1974, p. 147-159. 25 refs.

The basis for incorporating remotely sensed data into river basin control models for extensive river-reservoir systems is found in several works; however, these studies have been towards specific components of such a control model. Sensors have proven to be particularly effective for monitoring the parameters of chlorophyll concentration, suspended sediment, turbidity, thermal patterns, light penetration, etc., as well as evaluating contributions of the various components of the hydrologic cycle such as areal extent of snowpack, density of phreatophytes, and drainage-runoff patterns, to the overall system. Recent investigations in the basin of the Lower Colorado River (below Glen Canyon Dam) have attested to the feasibility of such a project. The wide range of hydrologic variables and water quality parameters found in the Lower Colorado present situations analogous to those in most other basins, but afford the advantage of year-round data collection with a minimal loss of imagery due to adverse meteorological factors. (Author)

A75-23782 * Resource inventory for multi-agency watershed planning. W. R. Enslin, B. Richason, III, and M. J. Bennett (Michigan State University, East Lansing, Mich.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 653-670. Grant No. NGL-23-004-083.

A demonstration study showed that NASA high-altitude color infrared (RB-57) imagery is useful for providing timely, relatively inexpensive, and accurate land-use information. The inventory encompassed 18 land-use categories for a 2590-square-kilometer Michigan watershed. The RB-57 photography was compared to alternative data collection methods (including ERTS and Skylab) and was found to have superior cost effectiveness for providing the desired information. A.T.S.

A75-23785 * The use of color infrared photography for wetlands assessment. W. R. Enslin and M. C. Sullivan (Michigan State University, East Lansing, Mich.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 697-719. 15 refs. Grant No. NGL-23-004-083.

A study was undertaken of Pointe Mouillee Marsh, located on Lake Erie, to assess shoreline erosion and to inventory and evaluate adjacent land as potential replacement for areas lost to erosion, and to provide better data sources for management decisions. The results of the study were: (1) Evaluation of low altitude oblique photography was useful in determining specifications of operational mission requirements; (2) Accurate base map revisions, reflecting shoreline erosion, were made using aerial photography and a Zoom Transfer Scope; (3) An aerial land cover inventory provided data necessary for the selection of adjacent lands suitable for marshland development; (4) A detailed inventory of vegetative communities (mapped from CIR), was made for management decisions; and (5) A carefully selected and well laid-out transect was a key asset to photo interpretation and analysis of vegetation. (Author)

A75-24609 The mapping and interpretation of snow conditions in Quebec-Labrador using ESSA-9 composite minimum brightness /CMB/ charts. J. T. Parry and B. J. Grey (McGill University, Montreal, Canada). *Photogrammetria*, vol. 30, Feb. 1975, p. 41-66. 22 refs. Research supported by the Department of Indian Affairs and Northern Development; Defence Research Board of Canada Contract No. SP2-7090153.

This study is concerned with the interpretation of snow conditions using 5-day composite minimum brightness (CMB) charts which are computer products derived from digitized and rectified satellite video data. The usefulness of CMB charts is tested in the study of the areal extent and temporal variation of the snow cover over the Quebec-Labrador peninsula during the period early March to late July, 1972. Using a Densichron densitometer and a grid overlay, the spatial distribution of brightness values was analyzed, and each CMB chart was reformated into a map of approximately 550 reflection values. Relationships were established between reflection values and both snow depth and recent snow occurrence, and the physiographic influences were identified. The data were used to follow temporal changes in the areal extent of the snow cover, and an attempt was made to use the data as an indicator of snow conditions. (Author)

A75-24673 * An optical filtering system for remote sensing of phytoplankton and suspended sediment. W. E. Bressette (NASA, Langley Research Center, Hampton, Va.). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 62, 63.

Aerial photography revealing blue-green Anacystis phytoplankton blooms in the Potomac River is presented. Data scanned were near-IR, green, and yellow nadir radiance; concurrent ground measurements are correlated with these data, including salinity, Secchi disk depth, chlorophyll a concentration, and river depth. In nonbloomed areas, R (radiance) is proportional to the reciprocal of Secchi depth for the green and yellow filters; in bloomed areas, R is constant for the green filter and random for the near-IR and yellow filters. S.J.M.

A75-27341 * # Evolution of the upper Colorado River as interpreted from ERTS-1 MSS imagery. S. Sinnock and W. N. Melhorn (Purdue University, Lafayette, Ind.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 199-218. 18 refs. Contract No. NAS5-21880.

A75-27342 # Enhancement of imagery for water resource studies. R. M. McCoy (Utah, University, Salt Lake City, Utah). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings.
Tucson, University of Arizona, 1974, p. 220-226.

The use of edge enhancement in the study of water resources is assessed. Two experiments are described, one to determine if the visible enhanced line pattern bears any relationship to terrain texture, and the other to determine if the automatic area measurement capability of most density slicing equipment can be used to make rapid measurements of edge enhanced lines. The results of the first experiment indicate a striking correlation and support the assumption that edge enhancement can be used for obtaining terrain texture data, while the second experiment produced no useful results, due possibly to a lack of a standardized procedure for using

the equipment. The results of preliminary edge enhancement work to determine the terrain texture and drainage areas in the Ohio River valley in Kentucky are discussed. F.G.M.

A75-27344 # **An evaluation of ERTS-1 imagery in reservoir dynamics.** L. G. Everett, L. S. Leonhart, and L. K. Lepley (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 259-274. 17 refs.

Lake Mead was selected as a test site for the evaluation of ERTS-1 imagery in studies of reservoir dynamics. It is pointed out that Lake Mead is the largest man-made reservoir in the Western Hemisphere and has a surface area of approximately 245 square miles. The ERTS-1 imagery utilized for analysis consisted of multispectral scanner bands 4, 5, 6, and 7 which record reflected radiation in the green through solar infrared region of the electromagnetic spectrum. The assumptions regarding possible mechanisms for observed phenomena are discussed along with the results obtained in an analysis of the ERTS-1 imagery. G.R.

A75-27345 * # **Development of a remote sensing technique to study the hydrology of earth stock tanks on a semiarid watershed.** C. B. Cluff and C. J. Lovely (Arizona, University, Tucson, Ariz.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings.
Tucson, University of Arizona, 1974, p. 275-279. 7 refs. Grant No. NGL-03-002-313.

The stock tanks considered are relatively small earthen reservoirs, built in tributary stream channels and drainageways. A remote sensing technique is developed for obtaining quantitative data on water levels and water losses from stock tanks. Details of the used approaches are discussed along with some difficulties which would have to be overcome in order to determine the effects of the stock tanks on stream flow. G.R.

A75-27346 # **Estimating irrigation water demands from remotely sensed imagery.** C. W. Johnson (California, University, Riverside, Calif.). In: Annual Conference on Remote Sensing in Arid Lands, 4th, Tucson, Ariz., November 14-16, 1973, Proceedings. Tucson, University of Arizona, 1974, p. 280-287.

Water demand factors and requirements are discussed along with approaches for determining the considered factors on the bases of multispectral ERTS imagery. The acreage summary of each field condition is combined with values concerning the average monthly water requirement in order to obtain water demand data for each field condition in acre feet of water. The investigation shows that a suitable approach utilizing a satellite system can provide water demand estimates which are very accurate. G.R.

A75-28525 # **Evolution of Gulf Stream eddies as seen in satellite infrared imagery.** H. G. Stumpf and P. K. Rao (NOAA, National Environmental Satellite Service, Suitland, Md.). *Journal of Physical Oceanography*, vol. 5, Apr. 1975, p. 388-393. 9 refs.

Pronounced eddies along the western edge of the Gulf Stream were again observed by the Very High Resolution Radiometer aboard the NOAA-2 satellite. A rare sequence of infrared images obtained over a period of seven days shows for the first time the complete evolution of meanders through the eddy stage. (Author)

A75-28606 * **Earth resources satellite systems for flood monitoring.** D. F. McGinnis (NOAA, National Environmental Satellite Service, Washington, D.C.) and A. Rango (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Geophysical Research Letters*, vol. 2, Apr. 1975, p. 132-135. 8 refs.

The environmental satellites NOAA-2 and ERTS-1 observed flooding in United States' rivers such as the Mississippi during 1973. Combination of NOAA-2 observation frequency and the ERTS-1 resolution provides an adequate satellite system for monitoring floods. Several polar-orbiting satellites of the ERTS type could view flooded areas at a reasonably high resolution every three to five days. A high-resolution earth-synchronous satellite would further enhance flood mapping by providing observations whenever clouds are absent. (Author)

N75-16048*# Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
WATER SURVEY OF CANADA: APPLICATION FOR USE OF ERTS-A FOR RETRANSMISSION OF WATER RESOURCES DATA Semiannual Progress Report, Jul. - Dec. 1974
R. A. Halliday, Principal Investigator and I. A. Reid Jan. 1975 9 p Sponsored by NASA ERTS
(E75-10127; NASA-CR-141980) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Water resources data including water level, water velocity, precipitation, air temperature, ice-out indicator, data collection platform battery check and water stage recorder clock operation have been transmitted from remote areas in Canada using the ERTS Data Collection System. The system has met all requirements. The suitability of satellite retransmission has been demonstrated. The present network will be expanded to 28 in 1975.

N75-16051* Geological Survey, Harrisburg, Pa.
THE USE OF EARTH RESOURCES TECHNOLOGY SATELLITE FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN
Richard W. Paulson *In* NASA. Wallops Station Data Collection System 1975 p 5-16
CSCL 08H

The earth resources data acquisition systems on ERTS are providing data from the earth's surface that have great potential for resources management. The Data Collection System is providing water resources data several times a day from widely scattered locations in the Delaware River Basin. Within the constraints of an experimental test, the data are being processed and released to water resources agencies in near-real time. The results of ERTS investigations have shown that there is a potential application for satellite-borne systems for earth resources data acquisition. It is becoming clear that the solutions to many natural resource problems can be found faster and more efficiently with the help of data acquisition systems such as those on the ERTS observatory. Under operational conditions, low cost battery-operated DCP's could provide the Geological Survey with data from a large number of field instruments. These data could be used by the Geological Survey to monitor the operational status of field instrumentation and could be used by cooperating agencies to monitor a wide range of earth resources conditions. Under operational conditions, the data flow could be in real time. The delay from time of data acquisition by ERTS to the time of data availability to data users could be reduced to seconds, rather than the present lag time of a few hours. Author

N75-16052* Department of the Environment, Ottawa (Ontario).
DATA RETRANSMISSION FROM WATER SURVEY OF CANADA GAUGING STATIONS USING THE ERTS DATA COLLECTION SYSTEM
Robert A. Halliday *In* NASA. Wallops Station Data Collection System 1975 p 17-20
CSCL 08H

Nine sites were selected for installation of Data Collection Platforms (DCPs) with the objective of obtaining one near real time water level reading a day from each site. Also the dependability, costs and other aspects of the system could be studied and decisions made with respect to the feasibility of operating a much larger network of DCPs. The number of transmissions received each day from the gauging stations varies from a maximum of 26 to 12 and a minimum of 10 to 3, depending on the location. Quality checks of data have indicated that the data are good. None of the nine DCPs have failed

once they have been successfully activated. The experience with the ERTS data collection system has been excellent. The DCP appears to be a rugged, reliable piece of equipment. The ones installed at water survey sites have withstood temperatures less than -40 C and the antennas have withstood wind speeds of over 80 kph (50 mph) and snow loads of 0.6 m (2 ft). Author

N75-16055* Corps of Engineers, Waltham, Mass.
USE OF ERTS-1 DCS IN THE MANAGEMENT AND CONTROL OF WATER RESOURCES SYSTEMS
Joseph W. Finegan, Jr. *In* NASA. Wallops Station Data Collection System 1975 p 45-52
CSCL 08H

The ERTS-1 experimental hydrologic Data Collection Platform System that has been established at the New England Division (NED), the reasons for getting involved with the experiment, some of the initial problems associated with the data collection hardware, and a preliminary conclusion based on operating experiences are reviewed. The New England Region includes the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. The entire area consists of approximately 97,000 sq. km. (60,000 square miles), half of which is in the state of Maine. The limits of the NED are all of Maine, New Hampshire and Vermont to the western limits of the Connecticut River basin, Massachusetts, Connecticut to the western edge of the Housatonic River basin and Rhode Island. All reservoirs have flood control as a primary purpose. Other uses include water supply, recreation and low flow augmentation. However, none of the reservoirs are presently operated for hydroelectric power, navigativn, or irrigation purposes. Basically then, flood control regulation is NED's primary concern. Author

N75-16068*# Stanford Research Inst., Menlo Park, Calif.
STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS Final Report, Sep. 1972 - Sep. 1974
Sidney M. Serebreny, W. E. Evans, and E. J. Wiegman Nov. 1974 112 p
(Contract NAS5-21841; SRI Proj. 2165)
(NASA-CR-139159) Avail: NTIS HC $5.25 CSCL 05B

The usefulness of dynamic display techniques in exploiting the repetitive nature of ERTS imagery was investigated. A specially designed Electronic Satellite Image Analysis Console (ESIAC) was developed and employed to process data for seven ERTS principal investigators studying dynamic hydrological conditions for diverse applications. These applications include measurement of snowfield extent and sediment plumes from estuary discharge, Playa Lake inventory, and monitoring of phreatophyte and other vegetation changes. The ESIAC provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The most unique feature of the system is the capability to time lapse the imagery and analytic displays of the imagery. Data products included quantitative measurements of distances and areas, binary thematic maps based on monospectral or multispectral decisions, radiance profiles, and movie loops. Applications of animation for uses other than creating time-lapse sequences are identified. Input to the ESIAC can be either digital or via photographic transparencies. Author

N75-16597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITES: NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW
Per Gloersen and Vincent V. Salomonson Oct. 1974 38 p refs Submitted for publication Original contains color illustrations
(NASA-TM-X-70819; X-910-74-309) Avail: NTIS HC $3.75 CSCL 22B

The relation of aereal extent of snow cover to the average monthly runoff in a given watershed was investigated by comparing runoff records with a series of snowcover maps. Studies using the high spatial resolution available with ERTS-1 imagery were carried out for the Wind River Mountains watersheds in Wyoming, where it was found that the empirical relationship varied with mean elevation of the watershed. In addition, digital image enhancement techniques are shown to be useful for identifying glacier features related to extent of snowcover, moraine characteristics, and debris average. Longer wavelength observations using sensors on board the Nimbus 5 Satellite are shown to be useful for indicating crystal size distributions and onset of melting on glacier snow cover. Author

N75-16956*# Environmental Research Inst. of Michigan, Ann Arbor.
A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Sep. - Nov. 1974
Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 10 Feb. 1975 4 p EREP
(Contract NAS9-13275)
(E75-10137; NASA-CR-142063; ERIM-102300-15-L) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Demonstration of the procedure for utilizing the model relating red and IR reflectance to surface soil moisture over regions of variable vegetation cover indicates that remote sensing may be able to make direct inputs into determination of this hydrologic parameter.

N75-16957*# Smithsonian Institution, Washington, D.C. Chesapeake Bay Center for Environmental Studies.
INVESTIGATIONS ON CLASSIFICATION CATEGORIES FOR WETLANDS OF CHESAPEAKE BAY USING REMOTELY SENSED DATA Annual Report, 10 Oct. 1972 - 9 Oct. 1973
Francis S. L. Williamson Dec. 1974 98 p refs
(Contract NAS6-1913)
(NASA-CR-137479) Avail: NTIS HC $4.75 CSCL 08B

The use of remote sensors to determine the characteristics of the wetlands of the Chesapeake Bay and surrounding areas is discussed. The objectives of the program are stated as follows: (1) to use data and remote sensing techniques developed from studies of Rhode River, West River, and South River salt marshes to develop a wetland classification scheme useful in other regions of the Chesapeake Bay and to evaluate the classification system with respect to vegetation types, marsh physiography, man-induced perturbation, and salinity; and (2) to develop a program using remote sensing techniques, for the extension of the classification to Chesapeake Bay salt marshes and to coordinate this program with the goals of the Chesapeake Research Consortium and the states of Maryland and Virginia. Maps of the Chesapeake Bay areas are developed from aerial photographs to display the wetland structure and vegetation. Author

N75-16959*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
INTERPRETATION OF REMOTE SENSING DATA IN THE BAYOU LAFOURCHE DELTA OF SOUTH LOUISIANA Annual Report, Feb. 1974 - Feb. 1975
Charles A. Whitehurst 28 Feb. 1975 23 p refs
(Grant NGL-19-001-105)
(NASA-CR-141233) Avail: NTIS HC $3.25 CSCL 08F

Initial efforts were directed toward a comprehensive ground truth program for the Bayou Lafourche Delta. The impact of transportation systems on the marsh environment, impounded marsh areas, proposed jetty systems at Belle Pass, Louisiana, and erosion and sediment transport in the southwestern canal, Lafourche Parish, Louisiana are studied. The use of color IR imagery for a vegetation study of spoil banks in the Bayou Lafourche Region is also discussed. J.A.M.

N75-17756*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Jan. 1975
LeRoy F. Silva, Principal Investigator Jan. 1975 3 p EREP
(Contract NAS9-13301)

(E75-10140; NASA-CR-142106) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. The analysis of the SI/4 S192 data over Ft. Wayne, Indiana, taken on January 25, 1974 indicates that the thermal resolution of the thermal band in the X-5 detector array is of sufficient quality to distinguish factories, school houses, commercial buildings, and groups of residential houses from the cooler background surroundings. It is speculated that the higher thermal energy being radiated from these manmade buildings is due to a combination of the heat loss of the buildings and to the high solar absorption by the black tar roofs.

N75-17765*# Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.
PALEO RIVER BEDS DETECTION BY MEANS OF MULTISPECTRAL IMAGES TAKEN FROM SKYLAB Progress Report
R. Cassinis and G. M. Lechi, Principal Investigators 6 Dec. 1974 7 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E75-10149; NASA-CR-142186; PR-4) Avail: NTIS HC $3.25 CSCL 08H

N75-17767*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXTRACTION AND UTILIZATION OF SPACE ACQUIRED PHYSIOGRAPHIC DATA FOR WATER RESOURCES DEVELOPMENT
A. Rango, J. Foster (Maryland Univ., College Park), and V. V. Salomonson Jan. 1975 31 p refs Submitted for publication (NASA-TM-X-70827; X-913-75-3) Avail: NTIS HC $3.75 CSCL 08H

ERTS-1 satellite imagery was evaluated as a means of providing useful watershed physiography information. From these data physiographic parameters such as drainage basin area and shape, drainage density, stream length and sinuosity, and the percentage of a watershed occupied by major land use types were obtained in three study areas. The study areas were: (1) Southwestern Wisconsin; (2) Eastern Colorado, and (3) portions of the Middle Atlantic States. Using ERTS-1 imagery at 1:250,000 and 1:100,000 scales it was found that drainage basin area and shape and stream sinuosity were comparable (within 10%) in all study areas to physiographic measurements derived from conventional topographic maps at the same scales. Author

N75-17768*# Smithsonian Institution, Washington, D.C.
CLASSIFICATION OF WETLANDS VEGETATION USING SMALL SCALE COLOR INFRARED IMAGERY Annual Report, 9 Oct. 1973 - 20 Dec. 1974
Francis S. L. Williamson Feb. 1975 27 p refs
(Contract NAS6-1913)
(NASA-CR-62091) Avail: NTIS HC $3.75 CSCL 08A

A classification system for Chesapeake Bay wetlands was derived from the correlation of film density classes and actual vegetation classes. The data processing programs used were developed by the Laboratory for the Applications of Remote Sensing. These programs were tested for their value in classifying natural vegetation, using digitized data from small scale aerial photography. Existing imagery and the vegetation map of Farm Creek Marsh were used to determine the optimal number of classes, and to aid in determining if the computer maps were a believable product. M.J.S.

N75-17771# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
A COMPARISON OF HIGH- AND LOW-ALTITUDE AERIAL INFRARED COLOR PHOTOGRAPHY FOR REMOTE SENSING OF LOUISIANA COASTAL MARSHLANDS
Charles A. Whitehurst and Judith A. Monte 1974 12 p refs Original contains color illustrations
Avail: NTIS HC $3.25

Infrared color positive transparencies (contact duplicates) were used to compare high- and low-altitude aerial color photography of the Louisiana marshlands. All the interpretation was visual, with differences such as year and season being taken into consideration. The results of the comparisons were tabulated to show the usefulness of each scale for the delineation and identification of certain natural, coastal, and man-made features. M.J.S.

N75-17772*# Alabama Univ., University.
WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY. PART 2: NON-CONSERVATIVE SPECIES TRANSPORT MODELS Interim Report
Gary C. April and Hua-An Liu Jan. 1975 205 p refs
(Contract NAS8-29100)
(NASA-CR-120621; BER-185-112-Pt-2) Avail: NTIS HC $7.25 CSCL 08H

Total coliform group bacteria were selected to expand the mathematical modeling capabilities of the hydrodynamic and salinity models to understand their relationship to commercial fishing ventures within bay waters and to gain a clear insight into the effect that rivers draining into the bay have on water quality conditions. Parametric observations revealed that temperature factors and river flow rate have a pronounced effect on the concentration profiles, while wind conditions showed only slight effects. An examination of coliform group loading concentrations at constant river flow rates and temperature shows these loading changes have an appreciable influence on total coliform distribution within Mobile Bay. S.S.C.

N75-17933# California Univ., Los Angeles. Dept. of Geography.
ESTUARINE SEDIMENTATION ALONG THE NATAL COAST, SOUTH AFRICA
Antony R. Orme Aug. 1974 56 p refs
(Contract N00014-69-A-0220-4035; NR Proj. 388-102)
(AD-A000485; TR-5) Avail: NTIS CSCL 08/7

The character and materials of sedimentation in estuaries and lagoons along the 570 km Natal Coast are described and analyzed. Sites examined include the Greater St. Lucia lagoon system with its 9 major contributing rivers, Richards Bay with its 2 main contributing rivers, and 28 rivers that discharge directly into the Indian Ocean without passing through an intermediate lagoonal filtering system other than their own estuaries. Discussion is based on field and remote sensing investigations and borehole data, and is supported by pertinent maps and cross-sections. The nature and processes of sedimentation along the Natal coast are representative of events along more than 2000 km of African coast from central Mozambique to eastern Cape Province. (Modified author abstract) GRA

N75-18642 Joint Publications Research Service, Arlington, Va.
EXPERIMENT IN THE USE OF REPEATED AERIAL SURVEYS IN A MOUNTAIN BASIN FOR DETERMINING THE SNOW RESERVES **c46**
O. P. Shcheglova and V. G. Gapishko *In its* Meteorol. and Hydrol., No. 11, 1974 (JPRS-63948) 24 Jan. 1975 p 71-80 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 11, 1974 p 56-62

The snow reserves in a mountain basin are determined on the basis of processing the data from repeated aerial surveys and calculations by the heat balance method are discussed. The schematic of the water reserves in the snow is compiled. Author

N75-18661 Wisconsin Univ., Madison.
PHOTOGRAPHIC REMOTE SENSING: A WATER QUALITY MANAGEMENT TOOL Ph.D. Thesis
John Francis VanDomelen 1974 260 p
Avail: Univ. Microfilms Order No. 74-19942

A technique for arriving at the energy returning from the particulate matter in the water. This technique works, whether a spectroradiometer or photography is used, and under various illumination conditions. The technique compares the vertical component of upwelling energy from a water body to that from a standard reflectance panel. The ratio of the two has been defined as the total relative albedo (At). Relative albedoes exist for the bottom (Ab) and surface (As) of a water volume. Total relative albedoes can be determined in the laboratory or the field through use of the spectroradiometer, or in the field through the use of photographic emulsion. To determine the relative volume albedo (Av), the relative bottom albedo (Ab) and the relative surface albedo (As), are subtracted from the total relative albedo (At). Dissert. Abstr.

N75-18667*# Delaware Univ., Newark. Coll. of Marine Studies.

APPLICATION OF ECOLOGICAL, GEOLOGICAL AND OCEANOGRAPHIC ERTS-1 IMAGERY TO DELAWARE'S COASTAL RESOURCES MANAGEMENT Final Report, Sep. 1972 - Jun. 1974

Vytautas Klemas, Principal Investigator, David S. Bartlett, William D. Philpot, Gary R. Davis, Robert H. Rogers (Bendix Corp., Ann Arbor, Mich.), and Larry Reed (Bendix Corp., Ann Arbor, Mich.) Dec. 1974 140 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21837)

(E75-10155; NASA-CR-142205; CMS-NASA-4-74) Avail: NTIS HC $5.75 CSCL 08A

The author has identified the following significant results. Data from twelve successful ERTS-1 passes over Delaware Bay have been analyzed with special emphasis on coastal vegetation, land use, current circulation, water turbidity and pollution dispersion. Secchi depth, suspended sediment concentration and transmissivity as measured from helicopters and boats were correlated with ERTS-1 image radiance. Multispectral signatures of acid disposal plumes, sediment plumes and slick were investigated. Ten vegetative cover and water discrimination classes were selected for mapping: (1) forest-land; (2) Phragmites communis; (3) Spartina patens and Distichlis spicata; (4) Spartina alterniflora; (5) cropland; (6) plowed cropland; (7) sand and bare sandy soil; (8) bare mud; (9) deep water; and (10) sediment-laden and shallow water. Canonical analysis predicted good classification accuracies for most categories. The actual classification accuracies were very close to the predicted values with 8 of 10 categories classified with greater than 90% accuracy indicating that representative training sets had been selected.

N75-18669*# Ecosystems International, Inc., Gambrills, Md.

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES Quarterly Technical Progress Report, Jul. - Sep. 1974

Harry L. Loats, Thomas R. Fowler, and Susan Frech Oct. 1974 118 p

(Contract NAS5-20567)

(NASA-CR-139179; ECO-74-C-3-1; QTPR-1) Avail: NTIS HC $5.25 CSCL 08H

A survey of the principal water resource users was conducted to determine the impact of new remote data streams on hydrologic computer models. The analysis of the responses and direct contact demonstrated that: (1) the majority of water resource effort of the type suitable to remote sensing inputs is conducted by major federal water resources agencies or through federally stimulated research, (2) the federal government develops most of the hydrologic models used in this effort; and (3) federal computer power is extensive. The computers, computer power, and hydrologic models in current use were determined. Author

N75-18692# National Environmental Satellite Service, Washington, D.C.

SNOW DEPTH AND SNOW EXTENT USING VHRR DATA FROM THE NOAA-2 SATELLITE

David F. McGinnis, Jr., John A. Pritchard, and Donald R. Wiesnet Feb. 1975 15 p refs

(NOAA-TM-NESS-63) Avail: NTIS HC $3.25

The NOAA-2 environmental satellite provides daily coverage of the Earth in the visible (0.6-0.7 microns) and thermal (10.5-12.5 microns) spectral bands. The ground resolution of the very high resolution radiometer (VHRR) is 1km at nadir. This improved resolution in the visible permits more detailed observations of snow features than was possible with previous operational satellites. A densitometer examination of a visible-band image from Feb. 11, 1973, which shows heavy snow cover in considerable detail over areas extending from Alabama to North Carolina, indicates that, in general, there is direct correlation between increasing brightness and increasing snow depths. Digitized reflectance data from the study area were compared with prestorm bare-ground digitized reflectance data of Feb. 6, 1973, to determine the relation of snow reflectivity to snow depths. A parabolic regression analysis of greatest satellite brightness versus greatest snow depth for 211 data pairs produced a correlation coefficient of 0.84. Author

N75-18695*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SEASONAL STREAMFLOW ESTIMATION EMPLOYING SATELLITE SNOWCOVER OBSERVATIONS

A. Rango, V. V. Salomonson, and J. L. Foster (Maryland Univ., College Park) Feb. 1975 39 p refs Submitted for publication

(NASA-TM-X-70840; X-913-75-26) Avail: NTIS HC $3.75 CSCL 08L

Low resolution meteorological satellite and high resolution earth resources satellite data have been used to map snow covered area over the upper Indus River and the Wind River Mountains of Wyoming, respectively. For the Indus River early spring snow covered area was extracted and related to April through June stream flow from 1967-1971 using a regression equation. Prediction of the April-June 1972 stream flow from the satellite data was within three percent of the actual total. Composited results from two years of data over seven Wind River Mountain watersheds indicated that LANDSAT-1 snow cover observations, separated on the basis of watershed elevation, could also be related to runoff in significant regression equations. Author

N75-18794# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.

PHYSICAL, BIOLOGICAL, AND CHEMICAL INVENTORY OF TWENTY-THREE SIDE CHANNELS AND FOUR RIVER BORDER AREAS, MIDDLE MISSISSIPPI RIVER Final Report

William P. Emge, R. Charles Solomon, Jeffrey H. Johnson, C. Rex Bingham, Billy K. Colbert, and Ross W. Hall Oct. 1974 606 p

(AD-A000602; AEWES-Misc-Paper-Y-74-5-App) Avail: NTIS CSCL 06/6

A list of reports is presented on the nine-foot channel project, along with aerial photographs of the side channels and river border areas, their schematics, and profiles. Other topics discussed include high bank and willow-line elevations, duration of water at or above willow line and high bank elevations, velocities and discharges, sediment analysis, analysis of water-geometry relationship, phytoplankton densities, zooplankton densities, and benthic macroinvertegrates. M.J.S.

N75-19779 Tennessee Univ., Knoxville.

DATA ACQUISITION AND INTERPRETATION FOR QUANTITATIVE THERMAL MAPPING Ph.D. Thesis

Gerhard Kreikebaum 1974 131 p

Avail: Univ. Microfilms Order No. 74-27218

An approach is presented to remote water surface temperature measurements using an airborne infrared line scanner or thermal mapper. The objective is a temperature determination with errors less than 0.3 C in the presence of an intervening atmospheric

and reflection from the water surface. The approach was (1) to modify and partially redesign an existing infrared scanner, including its data processing electronics, to make it capable of quantitative radiation measurements with the absolute accuracy and the temperature sensitivity required, and to minimize atmospheric and reflectivity effects by selection of a 9.5-11.5 micrometer wavelength band as the operating range of the instrument; (2) to develop a model in order to correct for atmospheric and reflectivity effects. The model predicts these effects as a function of air temperature, sky radiance, aircraft altitude, viewing angle and amount of atmospheric attenuation; and (3) to empirically find some or all of these parameters determining atmospheric and reflectivity effects by the thermal mapper data itself, thus obtaining a quantitative thermal map with few or no auxiliary measurements, particularly no surface measurements.

Dissert. Abstr.

N75-19790*# *Purdue Univ., Lafayette, Ind. Lab. for Applications* of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Feb. 1975
LeRoy F. Silva, Principal Investigator Feb. 1975 2 p EREP
(Contract NAS9-13301)
(E75-10166; NASA-CR-142215) Avail: NTIS HC $3.25 CSCL 08E

N75-19800*# Environmental Research and Technology, Inc., Lexington, Mass.
STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA Quarterly Progress Report, 15 Dec. 1974 - 15 Mar. 1975
James C. Barnes, Principal Investigator Mar. 1975 7 p EREP
(Contract NAS9-13305)
(E75-10176; NASA-CR-142225; QPR-8) Avail: NTIS HC $3.25 CSCL 08L

N75-19812# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PHYSICAL BIOLOGICAL AND CHEMISTRY INVENTORY OF TWENTY-THREE SIDE CHANNELS AND FOUR RIVER BORDER AREAS, MIDDLE MISSISSIPPI RIVER Final Report
William P. Emge, R. Charles Solomon, Jeffrey H. Johnson, C. Rex Bingham, and Billy K. Colbert Oct. 1974 166 p refs
(AD-A000608; AEWES-Misc-Paper-Y-74-5) Avail: NTIS CSCL 06/6

This report is one of nine reference sources to be used for the preparation of an Environmental Impact Statement (EIS) by the U.S. Army Engineer District, St. Louis. Twenty-three side channels were sampled in June and August 1972 and 13 of the 23 side channels and 4 river border areas were sampled in July 1973. Physicochemical parameters sampled were dissolved oxygen, temperature, turbidity, pH, and alkalinity. Biological elements sampled were plankton, benthos, and fish. Meteorological parameters included wind velocity, cloud cover, and ambient air temperature. Other physical parameters measured were bottom sediments and discharges. Methods and materials used to gather data are described. This report includes the physical, biological, and chemical raw data, a consolidation of data for each sampling area, and a brief summation of the results for each area. No attempt was made to correlate data among sampling areas. Another WES report will include an overall assessment of the aquatic data. (Modified author abstract)

GRA

N75-20781*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Dec. 1973 - Feb. 1974
George J. McMurtry, Principal Investigator Mar. 1975 8 p EREP
(Contract NAS9-13406)
(E75-10178; NASA-CR-142306) Avail: NTIS HC $3.25 CSCL 08H

N75-20782*# Environmental Research Inst. of Michigan, Ann Arbor.
SKYLAB: WATER DEPTH DETERMINATION Quarterly Progress Report, 1 Sep. - 30 Nov. 1974
Fabian C. Polcyn and D. R. Lyzenga, Principal Investigators 25 Mar. 1975 3 p EREP
(Contract NAS9-13278)
(E75-10179; NASA-CR-142307; ERIM-102100-17-L) Avail: NTIS HC $3.25 CSCL 08H

N75-20788*# Environmental Research Inst. of Michigan, Ann Arbor.
A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Dec. 1974 - Feb. 1975
Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 2 Apr. 1975 3 p EREP
(Contract NAS9-13275)
(E75-10185; NASA-CR-142313; ERIM-102300-16-L) Avail: NTIS HC $3.25 CSCL 08H

N75-20792*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF ERTS DATA WITHIN THE SUSQUEHANNA RIVER BASIN Progress Report, 1 Aug. - 30 Sep. 1973
G. J. McMurtry and G. W. Petersen, Principal Investigators 30 Sep. 1973 8 p ERTS
(Contract NAS5-23133)
(E75-10189; NASA-CR-142338) Avail: NTIS HC $3.25 CSCL 08H

N75-20793*# New Jersey Dept. of Environmental Protection, Trenton.
APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT Final Report, Jul. 1972 - Jun. 1974
Roland S. Yunghans, Principal Investigator, Edward B. Feinberg, Jo Ann Stitt, Robert L. Mairs, Frank J. Wobber, Robert T Macomber, Dennis T. Stanczuk, and David Thibult Oct. 1974 267 p refs Prepared in cooperation with Earth Satellite Corp., Washington, D. C. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21765)
(E75-10190; NASA-CR-142339) Avail: NTIS HC $8.50 CSCL 08J

The author has identified the following significant results. Quasi-operational information products for coastal zone management have been prepared using ERTS-1 imagery and collateral aerial photography. These products were applied to the practical regulation, protection, and management of New Jersey's coastal environment. Procedures were developed for the operational use of ERTS-1 data products within New Jersey's Department of Environmental Protection. Successful analysis and product preparation for operational needs centered on four major coastal resource problem areas: (1) detection of environmental changes in coastal areas, (2) siting of ocean outfalls, (3) monitoring of *offshore waste disposal, and (4) calculation of recession rates* along the Atlantic Shore. The utility and monetary benefits derived from ERTS and aircraft imagery for each problem area have been determined. The NJDEP estimates the possibility of $620,000 yearly savings through the use of an operational ERTS system and a one-time savings of $2.8 million on current or planned projects if a truly operational ERTS type satellite were available.

N75-20802*# Ecosystems International, Inc., Gambrills, Md.
IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES. SUMMARY OF COMPUTERS AND COMPUTER

GROWTH TRENDS FOR HYDROLOGIC MODELING AND THE INPUT OF ERTS IMAGE DATA PROCESSING LOAD Quarterly Progress Report, Sep. - Dec. 1974

Peter A. Castruccio and Harry L. Loats, Jr. Feb. 1975 51 p (Contract NAS5-20567)

(NASA-CR-143704; ECO-75-C-3-2; QPR-2) Avail: NTIS HC $4.25 CSCL 08H

An analysis of current computer usage by major water resources users was made to determine the trends of usage and costs for the principal hydrologic users/models. The laws and empirical relationships governing the growth of the data processing loads were described and applied to project the future data loads. Data loads for ERTS CCT image processing were computed and projected through the 1985 era. The analysis showns significant impact due to the utilization and processing of ERTS CCT's data. Author

N75-20808# Swedish Natural Science Research Council, Stockholm.

LAPPTRAESKET REPRESENTATIVE BASIN, SWEDEN, DATA VOLUME 1968 - 1970 Hydrological Data-Norden

Magnus Persson, ed. and Aaberg Lennart, ed. (Swed. Natl. Comm. for Intern. Hydrol. Decade) Swed. Natl. Comm. for Intern. Hydrol. Decade 1974 62 p refs Sponsored by Swed. Natl. Comm. for Intern. Hydrol. Decade

(ISBN-82-7086-016-6) Avail: NTIS HC $4.25

Information concerning station networks, instrumentation, and methodology for the acquisition and processing of data from Lapptrasket representative basin is given, together with tabular descriptions of the stations and location maps. Tables giving various data for precipitation, river discharge, snow cover, soil moisture, water temperature, and water chemical composition are also included. ESRO

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DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A75-19598 **Topographic accuracy of side-looking radar imagery.** E. E. Derenyi (New Brunswick, University, Fredericton, Canada). *Bildmessung und Luftbildwesen,* vol. 43, Jan. 1, 1975, p. 17-22. Research supported by the Defence Research Board and National Research Council of Canada.

An investigation was conducted to determine the accuracy with which the planimetric position and elevation of points can be obtained from side-looking airborne radar (SLAR) imagery. Measurements and preparatory tests are considered along with a topographic accuracy test, questions of planimetric accuracy, and aspects of height accuracy. On the basis of the results of the investigation a number of recommendations are made to improve the topographic accuracy of SLAR. G.R.

A75-19599 **Analysis of digital multispectral scanner /MSS/ data.** J. R. Baker, G. W. Marks, and E. M. Mikhail (Purdue University, West Lafayette, Ind.). *Bildmessung und Luftbildwesen,* vol. 43, Jan. 1, 1975, p. 22-27.

MSS data provide a two-dimensional representation of a generally three-dimensional space. A consideration of point elevations requires, therefore, the utilization of information external to the MSS data. Methods for the metric analysis of MSS data may be parametric or nonparametric. In parametric techniques some functional form, such as polynomials, is used to model the behavior of exterior orientation parameters. Both types of techniques are employed in the case of two different MSS data strips. G.R.

A75-19749 **The effect of pulse width on radar measurement of ocean wave height.** T. Y. Young (Miami, University, Coral Gables, Fla.). *International Journal of Electronics, First Series,* vol. 37, Dec. 1974, p. 833-848. 15 refs.

This paper examines various factors that affect the accuracy of radar measurement of ocean wave height from space, with particular emphasis on the effect of pulse width. It is shown that at a given signal-to-noise ratio, large or small, there is a pulse width that yields an optimal estimation accuracy. Both optimal and suboptimal estimation schemes are considered, and performance curves are presented. (Author)

A75-20203 * **A multilevel multispectral data set analysis in the visible and infrared wavelength regions.** L. L. Biehl and L. F. Silva (Purdue University, West Lafayette, Ind.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 164-175. 8 refs. Contract No. NAS9-13301.

Skylab multispectral scanner data, digitized Skylab color infrared (IR) photography, digitized Skylab black and white multiband photography, and Earth Resources Technology Satellite (ERTS) multispectral scanner data collected within a 24-hr time period over an area in south-central Indiana near Bloomington on June 9 and 10, 1973, were compared in a machine-aided land use analysis of the area. The overall classification performance results, obtained with nine land use classes, were 87% correct classification using the 'best' 4 channels of the Skylab multispectral scanner, 80% for the channels on the Skylab multispectral scanner which are spectrally comparable to the ERTS multispectral scanner, 88% for the ERTS multispectral scanner, 83% for the digitized color IR photography, and 76% for the digitized black and white multiband photography. The results indicate that the Skylab multispectral scanner may yield even higher classification accuracies when a noise-filtered multispectral scanner data set becomes available in the near future. (Author)

A75-21256 **Height measurement with stereoradar.** G. L. Bair and G. E. Carlson (Missouri, University, Rolla, Mo.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Feb. 1975, p. 167-176. 7 refs. Contract No. N00014-69-A-0141-0008. NR Project 387-069.

The effect of image dissimilarities on terrain height-measurement capabilities of three stereoradar techniques for obtaining stereoimage pairs is compared by using computer-generated simulated radar images. Simulated images are used because two of the stereoradar techniques are not presently implemented. The stereoradar techniques are: an improved single-flight technique, a previously proposed single-flight technique, and a two-flight technique which has been implemented. Improved stereoviewability is observed for the improved single-flight technique as compared with the pre-single-flight technique, and both single-flight techniques are better than the previously implemented two-flight technique. (Author)

A75-21348 **Space reflectors for radar and astronomy.** J. C. Yater (Satellite Technology Research Co., Lincoln, Mass.). *Applied Optics,* vol. 14, Feb. 1975, p. 526-536. 15 refs.

A new concept to utilize large flat optical reflecting surfaces in space to increase by several orders of magnitude the sensitivity and resolution of earth laser radar and astronomy measurements is described. The physical principles on which simple structures can maintain the optical reflectance gratings in space are derived, and the data processing requirements of the measurements are discussed. Space and ground system designs are given for a high resolution earth resources laser radar sensor, a synchronous earth and planetary science laser radar system, and an astronomy observation system including a variable very long compound grating interferometer system. (Author)

A75-21503 **Obtaining pulse characteristics of reflection of an underlying surface from one-dimensional realization of radar signal.** A. A. Zagorodnikov. *(Radiotekhnika i Elektronika,* vol. 19, Feb. 1974, p. 289-293.) *Radio Engineering and Electronic Physics,* vol. 19, Feb. 1974, p. 39-43. 9 refs. Translation.

A75-22375 # **An APT signal simulator.** W. W. Knapp and P. S. Sanik (New York State College of Agriculture and Life Sciences, Ithaca, N.Y.). *Journal of Applied Meteorology,* vol. 14, Feb. 1975, p. 132-135.

An inexpensive device designed to simulate video signals produced by the scanning radiometer system used on current NOAA series satellites is described. The simulator features independent control of both visible and infrared channel video levels during periods corresponding to the earth scan portions of each scan line. The known and adjustable signal levels provided by this simulator unit simplify the tasks of calibration, adjustment and servicing APT display systems. (Author)

A75-22531 # **Skylark rocket photography as an aid to developing countries.** J. R. Hardy (Reading, University, Reading, England). In: Seminar on Space Applications of Direct Interest to Developing Countries, São Jose dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São Jose dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 86-97. 18 refs. Ministry of Defence (Procurement Executive) Contracts No. AT/2035/015SP; No. AT/2035/025/ASA.

Rockets can be used to obtain space altitude photography of up to 400,000 sq km of the earth's surface with one launch, using only limited launching facilities. The position of rockets vis a vis alternative platforms is briefly discussed. Analysis has been carried out of such material obtained from Skylark rockets in Australia and Argentina. Photography has been rectified and provides a map base at scales of 1/250,000 or smaller. Land use and vegetation mapping has been carried out. Cultivated and non-cultivated areas have been delimited, and within the cultivated area photographed, crop areas statistics have been estimated with an accuracy of 85%. Resources survey and mapping has been carried out; land systems maps have been produced. Within these land systems specific topics have been mapped, for example geology, likely mineral areas, geomorphology, soils, hydrology, soil erosion and salinity, and land capability.

(Author)

A75-22724 Computer enhancement of ERTS-1 images for ocean radiances. G. A. Maul, R. L. Charnell, and R. H. Qualset (NOAA, Physical Oceanography Laboratory, Miami, Fla.). *Remote Sensing of Environment*, vol. 3, no. 4, 1974, p. 237-252. 12 refs. NOAA-supported research.

Subtle contrasts and low radiances observed by the ERTS multispectral scanner over the ocean require computer enhancement for adequate analysis. Experiments designed to evaluate contrast stretching, ratioing, differencing, smoothing, filtering, and false-color enhancing, indicate that the best information can be extracted by simple contrast stretching. Spectral analysis of the data shows that a low-pass, two-dimensional filter kernel, designed to be 6 db down at 10 scanspots, effectively eliminates the six-line banding caused by the multispectral scanner design. Automatic contouring techniques require careful scrutiny because data fields are created which can lead to false interpretations. Joint histograms of oceanic radiances did not prove to be useful due to the low range of energy in the several spectral intervals. Comparisons of satellite data with surface ship observations confirm theoretical predictions of the difficulty in interpreting scenes of the coastal zone. (Author)

A75-22827 # Onboard radiometers of the Cosmos 149 and Cosmos 320 satellites, and their operation in space (Radiometry sputnikov 'Kosmos-149' i 'Kosmos-320' i ikh rabota v kosmose). A. K. Gorodetskii, M. S. Malkevich, A. I. Pashkov, and G. V. Rozenberg. In: Space Arrow: Optical studies of the atmosphere. Moscow, Izdatel'stvo Nauka, 1974, p. 186-198. 17 refs. In Russian.

The principles of operation of the radiometers in a space environment are described, and are compared with the characteristics of radiometers employed onboard meteorological satellites. The influence on radiation temperature measurements of such error sources as deviations of the amplifier zero from the radiation zero of the instrument, or incomplete symmetry of the optical scheme, which may lead to the generation of parasitic signals, is examined. The sensitivity aspects of the radiometers are discussed. V.P.

A75-23126 Remote sensing of earth resources; Summer Seminar, Ecole Nationale d'Ingénieurs, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings (La télédétection des ressources terrestres; Ecole d'Eté, Ecole Nationale d'Ingénieurs, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings). Seminar sponsored by the Centre National d'Etudes Spatiales and Organisation des Nations Unies. Paris, Centre National d'Etudes Spatiales, 1974. 545 p. In French and English.

Papers are presented dealing with the development and use of new techniques in information collating and measurement relevant to the expanding field of remote sensing of natural terrestrial phenomena via satellite electromagnetic receptors. Categories covered comprise remote sensing systems, data acquisition, data treatment techniques, data exploitation, legal problems, conferences presented complementarily to the convention course, and balloon-airplane teledetection operations. Topics treated include: choice and preparation of large- and small-scale remote sensing sites, present and future NASA earth resources related satellite programs, a systems approach to the use of remote sensing, mechanical scanning systems, optical processing of images in coherent light, applications of teledetection to the study of fluids found in nature, and cartographic communication of data furnished by thermography and by airborne multiband photography.

S.J.M.

A75-23127 # Teledetection - A definition (La télédétection - Définition). A. Alouges (Centre National d'Etudes Spatiales, Toulouse, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 5-8. In French.

By teledetection is meant all processes providing information on an object without the sensor or measuring apparatus used being in contact with the object. The example of photography is taken as an explanation. Physical limitations and limitations in application of teledetection techniques are described. The definition is then narrowed down to the study of electromagnetic radiation incident on the earth's surface. A system of teledetection based on this definition is diagrammed. S.J.M.

A75-23128 # Choice and preparation of large- and small-scale teledetection sites (Choix et préparation des sites de grande et petite échelle). A. Perrier (Institut National de la Recherche Agronomique, Versailles, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 55-68. In French.

Benefits of choosing a site, means of establishing landmarks to link the teledetection measurements to the ground phenomena, criteria involved in the choice (economy, scientific value, representativity, familiarity to observers, simplicity, and reference points available), and preparatory knowledge and study of the site are discussed. The site must be equipped with calibration apparatus as well. S.J.M.

A75-23129 # Aircraft remote sensing platforms (Les plateformes /avions/ de télédétection). C. Roy (Institut Géographique National, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 69-73. In French.

A general review of some of the aerodynamics involved in airplane performance, the factors influencing the choice of a remote sensing air plane, and certain operational constraints are presented. The basic systems aboard an aircraft are listed, such as propulsion, guidance, life support, electrical equipment, and high-lift devices. The constraints are imposed by the vehicle itself, by the sensors installed on it, and by the nature of the mission. S.J.M.

A75-23136 # Mechanical scanning systems (Les systèmes à Balayage mécanique). A. Baudoin (Institut Géographique National, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 215-227. In French.

A definition and a general scheme of scanning are given. A description of the various types of scanning is provided, as well as an explanation of the geometric properties of linear scanning that are relevant to radiometry. The scanning process is classified into two categories: (1) when the scanner is located between the objective lens or mirror and the terrain to be analyzed; and (2) when the scanner is between the objective and the detector. In the section on geometry,

the means of image analysis during scanning are detailed and the interpretation of photographic reconstructions is elucidated. S.J.M.

A75-23142 # Methodology of the use of teledetection (Méthodologie de l'exploitation). M. Guy (Institut Français du Pétrole, des Carburants et Lubrifiants, Rueil-Malmaison, Hauts-de-Seine, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 331-339. In French.

The present work describes limitations on the use of teledetection, rules for interpreting teledetection data, and operational processes and methods of implementation involved in the use of teledetection. Technical, climatic, and meteorological limitations are discussed. Global and analytical methods, concepts of texture and structure, a general conception of the structural-textural model, and types of interpretation are treated under the heading of rules of interpretation. S.J.M.

A75-23143 # Applications of teledetection to the study of fluids found in nature (Applications de la télédétection à l'étude des fluides naturels). J.-V. Avias (Montpellier II, Université, Montpellier, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 341-399. 41 refs. In French.

The advantages of using teledetection to study the cycles and properties of gaseous and liquid natural fluids are discussed. A review of the interaction of certain characteristics of the fluids with electromagnetic radiation (the only means of detection envisioned) is given. The knowledge of fluid cycles is seen as crucial to problems involving natural resources and control of the environment. Both surface and subterranean waters would be dealt with by this approach. A summary of the present state of and outlook on research and development of applicable teledetection techniques is provided. A number of photographs supplements the text. S.J.M.

A75-23145 # Bioclimatology and remote sensing (Bioclimatologie et télédétection). S. de Parcevaux (Institut National de la Recherche Agronomique, Versailles, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 407-420. 11 refs. In French.

Bioclimatology is defined and applications of remote sensing in bioclimatology are enumerated. Basic analytical parameters are described, such as surface energy balance, radiation flux, thermal and water flux, and scale influence on energy balance measured. Empirical applications concerning correlation studies can be developed before more refined analytical methods have been established, especially in the realms of crop sanitation and frost damage. Much work remains to be done in the interpretation of remote sensing data. S.J.M.

A75-23146 # Teledetection of earth resources by satellites - Legal aspects (La télédétection des ressources terrestres par satellites - Aspects juridiques). M. A. Tchernonog (Centre National d'Etudes Spatiales, Paris, France). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 423-441. 27 refs. In French.

Some of the economic and political problems resulting from satellite teledetection, and legal solutions to them, are presented. An internationally coordinated set of regulations is proposed that would preserve territorial sovereignity while making data available to the entire international community. Some of the far-reaching advantages of using satellite teledetection are summarized. The effectiveness of such a set of regulations would depend on the conditions under which its promulgation was assured. The territorial problem is segregated into questions concerning the spatial sector and those regarding the terrestrial sector. Several legal systems currently in use are described. S.J.M.

A75-23341 * Skylab S-193 altimeter experiment performance, results and applications. J. T. McGoogan, C. D. Leitao (NASA, Wallops Flight Center, Wallops Island, Va.), L. S. Miller (Applied Science Associates, Inc., Apex, N.C.), and W. T. Wells (Wolf Research and Development Corp., West Concord, Mass.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 291-300. 10 refs.

A description of the Skylab altimeter instrument system along with the appropriate system error model is presented. The data processing flow, orbit computation, and topographic recovery techniques are discussed. Some data analysis results are presented which indicate excellent correlation with underwater topographic features. In addition, results are shown which indicate that the instrument performance was as expected. (Author)

A75-23344 A two satellite technique for measuring the deflection of the vertical /the dovimeter/. S. M. Yionoulis and H. D. Black (Johns Hopkins University, Silver Spring, Md.). In: International Symposium on Applications of Marine Geodesy, Columbus, Ohio, June 3-5, 1974, Proceedings. Washington, D.C., Marine Technology Society, 1974, p. 331-342. 8 refs. Contract No. N00017-72-C-4401.

A system is proposed to measure the deflection of the vertical (DOV) at sea. Two earth satellites are used, separated by about 200 km in the same, near-polar orbit. Each carries a radar altimeter. A 3-GHz satellite-to-satellite Doppler link connects the two satellites. By subtracting consecutive readings of the altimeter in one satellite, the DOV component along the satellite's ground track is determined. Due to the earth's rotation, the satellite ground tracks are separated by about 14 km; thus by subtracting the altimeter readings in one satellite from those in the other, the DOV component across the ground tracks is found. Since all altimeter readings are differenced, only precision, not absolute accuracy of altitude measurement is required. Satellite orbits integrate high-frequency geodetic effects; these are highly correlated between and along the satellite orbits, and introduce little error. (Author)

A75-23440 * Earth resources technology satellite /ERTS/ data collection and transmission buoys for inland, neritic and oceanic waters. W. S. Chapman and H. H. Yen (Sperry Rand Corp., Sperry Support Services Div., Huntsville, Ala.). *ASM, SME, and ASNT, Western Metal and Tool Exposition and Conference, Los Angeles, Calif., Mar. 11-15, 1974, SME Paper MM74-711.* 22 p. 5 refs. *Contract No. NAS8-21812.*

As a result of a consortium of several industries and organizations, an economical, versatile, and stable data collection and transmission buoy has been designed, developed, and deployed to gather and transmit water quality data to a ground receiving station at three-minute intervals and to the earth resources technology satellite (ERTS) as it passes over the deployed buoy every 12 hours. The buoy system, designed for both fresh and salt water application, gathers data inclusive of temperature measurement, conductivity, relative acidity, dissolved oxygen, current speed, and direction. The mechanical design philosophy used to determine and satisfy boundary conditions involving stability, ease of deployment, servicing and maintenance, minimal manufacturing costs, and fresh and salt water installation capability is discussed. The development of peripheral handling equipment and anchoring systems is described. S.J.M.

A75-23487 * **Sensor performance evaluation of the Skylab multispectral photographic facility.** F. J. Corbett (Itek Corp., Lexington, Mass.). In: Image assessment and specification; Proceedings of the Seminar-in-Depth, Rochester, N.Y., May 20-22, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1974, p. 239-246. Contract No. NAS9-10698.

Results of resolution tests for multispectral imagery from Skylabs 2, 3, and 4 are presented. Methods employed were visual edge matching and edge slope analysis, and resolution was evaluated as a function of spectral band, EREP pass, target orientation, field of view, exposure, and contrast. Preflight and postflight image quality data were compared. The multispectral image quality has equaled or slightly exceeded design predictions. P.T.H.

A75-23488 * **Measurement of the earth resources technology satellite /ERTS-1/ multi-spectral scanner OTF from operational imagery.** R. A. Schowengerdt, R. L. Antos, and P. N. Slater (Arizona, University, Tucson, Ariz.). In: Image assessment and specification; Proceedings of the Seminar-in-Depth, Rochester, N.Y., May 20-22, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1974, p. 247-257. 10 refs. U.S. Department of the Interior Grant No. 14-08-0001-G-86; Contract No. NAS5-21849.

The optical transfer function (OTF) of some typical ERTS-1 multispectral imagery was obtained by comparison of matched sets of aircraft underflight and ERTS photographic and digital images. One-dimensional OTF analysis consisted in obtaining U-2 and ERTS microdensitometer scans followed by density to transmission conversion, microdensitometer aperture correction, exposure calibration, scan correlation scale optimization, OTF calculation, obtaining a form weighted average of the OTFs, transformation of the OTFs back to the spatial domain (giving the line spread function or LSF), and application of a window function to the LSF resulting in a smoothed OTF. Date-to-date comparison of ERTS OTFs showed a drop in quality on April 4, 1973, compared with January 4, 1973. P.T.H.

A75-23489 **MTF analysis techniques applied to ERTS-1 and Skylab-2 imagery.** R. Welch (Georgia, University, Athens, Ga.). In: Image assessment and specification; Proceedings of the Seminar-in-Depth, Rochester, N.Y., May 20-22, 1974.
Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1974, p. 258-262. 15 refs. U.S. Geological Survey Contract No. 14-08-0001-13167.

The applicability of modulation transfer functions (MTF) analysis techniques for evaluating satellite sensor performance is assessed. Analysis of ERTS data, limited to RBV laboratory exposures and a few operational images obtained with both the RBV and MSS sensors, consisted of deriving MTFs from microdensometer edge traces of the images. The images and the analysis procedures are described, and the data are tabulated or graphed. Skylab images were selected from numerous second generation photographs on file at the Johnson Space Center, and analysis was similar to that for ERTS images. The high consistency in the Skylab MTFs is noted, and average measured MTFs are produced and compared with predicted MTFs. Correlation of the predicted and measured MTFs with system resolution data obtained under laboratory conditions is used in determining the resolution values of operational exposures. The ground resolution value of the ERTS images is given as approximately 250 meters for low contrast targets, while the Skylab photographs are given values of 25 to 145 meters, depending on the camera system used. F.G.M.

A75-23757 **Digital processing of microwave radiometric images.** J. O. Hooper and J. B. Seybold (U.S. Naval Weapons Center, China Lake, Calif.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 173-192. 7 refs. USAF-supported research.

Terrestrial microwave radiometry (MICRAD) provides a means of obtaining images of the earth's surface (day and night) through clouds, rain, and snow cover. An experimental imaging MICRAD system operating at 33.6 GHz (8.9 mm) is described. Flight tests revealed that the analog processor used to display the MICRAD images was inadequate. Digital programs were designed, using which accurate geometrical and amplitude images could be produced. In addition, digital processing made it possible to use such techniques as nonlinear amplitude quantization, pseudo-color enhancement, and image screening and enhancement. V.P.

A75-23758 **Automatic classification methods applied to multispectral photography.** J. N. P. Beers and J. van Kuilenburg (NIWARS, Delft, Netherlands). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 207-222. 14 refs.

In this article, an evaluation of automatic processing methods is reported, as applied to multispectral photography, which was obtained in a program concerning the airborne mapping of recent geology. The imagery was obtained with a cluster of five cameras, after that digitized by a computer controlled densitometer, and processed further by a digital computer. Preprocessing of the data appeared to be essential in order to remove systematic distortions. Several classification methods, both statistical and nonstatistical, were implemented and applied to the imagery of a test area. The methods studied comprise the maximum-likelihood decision rule, the sequential decision rule, the minimum distance to mean criterion, the linear discriminant method and a nonsupervised clustering method. For classification purposes the maximum-likelihood decision rule appears to be most suitable. (Author)

A75-23791 **Lineaments on a space photograph of the Balkhash region.** A. A. Grigor'ev and G. A. Putintseva (Leningradskii Gosudartsvennyi Universitet, Leningrad, USSR). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 805-813.

A method is proposed for determining the reliability of the lineaments identified on a processed space photograph. The method is applied to a black-and-white photograph (scale 1:7,500,00) of the Balkhash region, obtained by a Saliut spacecraft from a height of 225 km. V.P.

A75-24670 **Lineaments on a space photograph of the Balkhash region.** A. A. Grigor'ev and G. A. Putintseva (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). In: Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. New York, Lewis Winner, 1974, p. 18, 19.

A75-26087 **Semi-automatic map digitizing system.** R. B. Solosko, H. F. Ryan, G. M. Lewandowski, W. R. Hancock, R. C. Ahlgren, and G. Gaidasz (Calspan Corp., Buffalo, N.Y.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record.
New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 477-481.

An interactive computer system has been developed to digitize topographic charts and thematic maps (such as land use maps). This system, called DIGIMAP, uses automatic image processing and computer assisted operator editing techniques for the encoding of line data. The DIGIMAP System provides a new, efficient method for computer encoding of geographic and cartographic information. (Author)

A75-28206 **ERTS color image maps.** R. B. McEwen and J. W. Schoonmaker, Jr. (U.S. Geological Survey, Reston, Va.). *(American Congress of Surveying and Mapping and American Society of Photogrammetry, Fall Meeting, Washington, D.C., Sept. 9-16, 1974.) Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 479-487, 489. 9 refs.

The U.S. Geological Survey has prepared several experimental color-image maps from ERTS-1 images. Examples are the gridded image of Upper Chesapeake Bay and the mosaic of New Jersey. Both were printed at a scale of 1:500,000 with a full UTM grid and placed on public sale in February 1974. A color mosaic of Florida is being prepared from 16 separate scenes. It also will be printed at 1:500,000 scale. The publication of maps from satellite images has required the development of innovative procedures combining computational photogrammetry, image geometric control, photomechanical mosaicking, and color lithography. These color-image maps are the first to meet cartographic standards and to be lithographed for public sale at a nominal charge. The detailed procedures and equipment are described, along with some of the results. (Author)

A75-28207 **Cost of aerial photography.** J. J. Ulliman (Minnesota, University, St. Paul, Minn.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 491-497. 14 refs.

An investigation is conducted concerning the differences between acquisition costs involved in the case of medium scale and small scale aerial photography. Approaches used in obtaining comparative cost data are discussed along with the advantages of purchasing existing photography and questions of contracting for aerial photography. Attention is given to performance and cost of suitable aircraft types, aircraft operational costs, film and print costs, and laboratory labor costs. The investigation shows that under certain assumptions high-altitude aerial photography can have a cost advantage for some large projects. G.R.

A75-28210 * **Processing corrections for Skylab photographic imagery.** H. E. Lockwood and G. E. Sauer (Technicolor Graphic Services, Inc., Houston, Tex.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Apr. 1975, p. 523-532. Contract No. NAS9-11500.

Camera filters were inadvertently omitted from the six-channel multispectral photographic camera (S190A) during the exposure of the first roll of film from each channel on the final manned Skylab mission. Each of the films was overexposed and degraded as a result of the filter omissions. Explained are the techniques used by the NASA/JSC Photographic Technology Division to evaluate and process those films. These or similar techniques can be used in other photographic multispectral remote sensing applications in which black-and-white infrared and panchromatic or color infrared film are degraded due to loss of filtration or to overexposure. Results prove that data may be salvaged after camera exposure errors are made thus saving the expense of reacquiring data. (Author)

N75-16031 *# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Dec. 1974
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 15 Jan. 1975 7 p EREP
(Contract NAS9-13280)
(E75-10110; NASA-CR-140921; ERIM-101900-46-L) Avail: NTIS HC $3.25 CSCL 05B

N75-16187 National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY: KEY TO METEOROLOGICAL RECORDS DOCUMENTATION NO 5.4
Environ. Data Serv. Nov. 1974 99 p refs
Avail: NTIS HC $4.75

Current cloud data obtained by NOAA's operational environmental satellites is described. Daily global satellite imagery is presented in condensed form as a guide to data stored in NOAA archive, and is designed to assist users in selecting data for research and climatological use. Operational data from the scanning radiometers of NOAA 2 and subsequent NOAA environmental satellites is documented. Author

N75-16188 + National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, NOVEMBER 1974 Key to Meteorological Records Documentation No 5.4
Jan. 1975 96 p refs
Avail: NTIS HC $4.75

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

N75-16960 *# Texas Instruments, Inc., Dallas.
INFRARED INTERFEROMETER SPECTROMETER AND RADIOMETER (IRIS) INSTRUMENT FOR MARINER/JUPITER/SATURN 1977 (MJS'77) Quarterly Report, 12 Jul. - 12 Oct. 1974
D. D. Vanous Oct. 1974 217 p refs
(Contract NAS5-20498)
(NASA-CR-143677; U2-863919-1; QR-2) Avail: NTIS HC $7.25 CSCL 14B

The development and characteristics of the infrared interferometer spectrometer and radiometer (IRIS) instrument for use with the Mariner/Jupiter/Saturn space probe. The subjects discussed are: (1) the electronic design, (2) the opto-mechanical design, (3) reliability analysis, (4) quality control, and (5) program management. Author

N75-17207 * General Electric Co., Philadelphia, Pa.
IMAGE DATA PROCESSING OF EARTH RESOURCES MANAGEMENT
A. W. DeSio *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 201-218

CSCL 08G

Various image processing and information extraction systems are described along with the design and operation of an interactive multispectral information system, IMAGE 100. Analyses of ERTS data, using IMAGE 100, over a number of U.S. sites are presented. The following analyses are included: investigations of crop inventory and management using remote sensing; and (2) land cover classification for environmental impact assessments. Results show that useful information is provided by IMAGE 100 analyses of ERTS data in digital form. J.M.S.

N75-17211 * TRW Systems Group, Redondo Beach, Calif.
APPLICATION OF ADVANCED SIGNAL PROCESSING TECHNIQUES TO THE RECTIFICATION AND REGISTRATION OF SPACEBORNE IMAGERY
R. H. Caron, S. S. Rifman, and K. W. Simon *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 245-255 refs
CSCL 08G

The development of an ERTS/MSS image processing system responsive to the needs of the user community is discussed. An overview of the TRW ERTS/MSS processor is presented, followed by a more detailed discussion of image processing functions satisfied by the system. The particular functions chosen for discussion are evolved from advanced signal processing techniques rooted in the areas of communication and control. These examples show how classical aerospace technology can be transferred to solve the more contemporary problems confronting the users of spaceborne imagery. Author

N75-17770# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY

OF MARSH BUGGY TRACKS
Charles A. Whitehurst and Linda N. Doiron 1973 13 p refs Original contains color illustrations
Avail: NTIS HC $3.25

Temporary and permanent damage of marshland environments due to the use of marsh buggies in the Louisiana coastal zone was investigated. The two kinds of buggies used, tracked and wheeled vehicles, create similar effects by compacting the marsh sediments and vegetation. It was found that the degree of compacting and subsidence due to loads is dependent on the marsh type, especially the moisture content of the marsh. Color infrared imagery was used to determine the location of the buggy routes and to quantify the extent of tracks in a selected area where the marsh is seriously dissected. The imagery was also used to show successive stages of destruction. Author

N75-18283*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
COOLING SYSTEMS FOR SATELLITE REMOTE SENSING INSTRUMENTATION
R. J. Copeland and J. A. Oren 16 Sep. 1974 128 p refs
(Contracts NAS1-10900; NAS1-13500)
(NASA-CR-132517; Rept-2-53002/4R-3182) Avail: NTIS HC $5.75 CSCL 22B

The characteristics of a cryogenic cooling system for the Pollution Monitoring Satellite (PMS) are discussed. Studies were conducted to make the following determinations: (1) the characteristics and use of proven and state-of-the-art cryogenic cooling systems for six specified ranges of performance, (2) the system most applicable for each of the six cooling categories, and (3) conceptual designs for candidate system for each of the six representative cooling categories. The six cooling categories of electrikal loads are defined. The desired mission life for the cooling system is two years with both continuous and intermittent operating conditions. Author

N75-18547*# Technicolor Graphic Services, Inc., Houston, Tex.
THERMAL AND RADIATION DAMAGE TO SL/1 EREP FILMS
Lincoln Perry Sep. 1973 16 p
(Contract NAS9-11500)
(NASA-CR-141660; TN-73-8) Avail: NTIS HC $3.25 CSCL 14E

Tests were conducted to determine the present sensitometric characteristics of the SL/1 EREP films stored in Skylab. These films underwent the high temperature environment at the beginning of the mission and have since been stored outside the film vault. As a result, the films will have received a radiation dose estimated at approximately 12 rads by the end of SL/3. Author

N75-18548*# Technicolor Graphic Services, Inc., Houston, Tex.
FULTRON PROCESSING OF EARTH RESOURCES ORIGINAL FILMS Interim Report
Lincoln Perry May 1973 10 p
(Contract NAS9-11500)
(NASA-CR-141655; TN-73-3) Avail: NTIS HC $3.25 CSCL 14E

The film/process combinations being used in the Earth Resources programs are reviewed to determine if it is possible to reduce the number of original film processing controls. Author

N75-18665*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA *Monthly Progress Report, Jan. 1975*
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 24 Feb. 1975 5 p EREP
(Contract NAS9-13280)
(E75-10153; NASA-CR-142203; ERIM-101900-48-L) Avail: NTIS HC $3.25 CSCL 14E

N75-18670*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATION RELATED TO MULTISPECTRAL IMAGING SYSTEMS Final Report, 26 Jul. 1969 - 15 May 1974
Richard F. Nalepka and Jon D. Erickson Dec. 1974 186 p refs
(Contract NAS9-9784)
(NASA-CR-141701; ERIM-190100-46-f) Avail: NTIS HC $7.00 CSCL 14B

A summary of technical progress made during a five year research program directed toward the development of operational information systems based on multispectral sensing and the use of these systems in earth-resource survey applications is presented. Efforts were undertaken during this program to: (1) improve the basic understanding of the many facets of multispectral remote sensing, (2) develop methods for improving the accuracy of information generated by remote sensing systems, (3) improve the efficiency of data processing and information extraction techniques to enhance the cost-effectiveness of remote sensing systems, (4) investigate additional problems having potential remote sensing solutions, and (5) apply the existing and developing technology for specific users and document and transfer that technology to the remote sensing community. Author

N75-18698*# Kansas Univ., Lawrence. Remote Sensing Lab.
RADAR STUDIES RELATED TO THE EARTH RESOURCES PROGRAM
J. Holtzman Mar. 1972 171 p refs Original contains color illustrations
(Contract NAS9-10261)
(NASA-CR-141643; CRES-TR-177-26) Avail: NTIS HC $6.25 CSCL 20I

The radar systems research discussed is directed toward achieving successful application of radar to remote sensing problems in such areas as geology, hydrology, agriculture, geography, forestry, and oceanography. Topics discussed include imaging radar and evaluation of its modification, study of digital processing for synthetic aperture system, digital simulation of synthetic aperture system, averaging techniques studies, ultrasonic modeling of panchromatic system, panchromatic radar/radar *spectrometer development, measuring octave-bandwidth response* of selected targets, scatterometer system analysis, and a model Fresnel-zone processor for synthetic aperture imagery. M.J.S.

N75-18847 + National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, DECEMBER 1974 Key to Meteorological Records Documentation no. 5.4
Jan. 1975 98 p refs
Avail: NTIS HC $4.75

Cloud data obtained by scanning radiometers of NOAA environmental satellites are reproduced daily in hemispheric mosaics by computer. Data swaths begin near 20 E longitude *and progress westward through the 24 hour period to the latest* swath of the day near 30 E. G.G.

N75-18861# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
DIRECT READOUT METEOROLOGICAL SATELLITE DATA PROCESSING WITH A LOW-COST COMPUTER LINKED SYSTEM
T. H. VonderHaar, D. Raynolds, and L. Lilie Sep. 1974 48 p refs
(Grant NSF GA-31588)
(PB-237669/7; AS-Paper-227) Avail: NTIS HC $3.75 CSCL 04B

Visible and infrared image data from the scanning radiometer on the NOAA-2 and NOAA-3 satellites are received by a VHF APT Station at Colorado State University. In addition to producing the regular hard-copy photographs, the taped signal is specially processed by electronic means, converted from analog to digital form and further processed in the computer. Details of the

processing steps and equipment are described and the meteorological application of the full-resolution processed images are noted for cases of both synoptic and mesoscale weather situations.
GRA

N75-18909 Michigan Univ., Ann Arbor.
INFORMATION EXTRACTION AND MULTI-ASPECT TECHNIQUES IN REMOTE SENSING Ph.D. Thesis
William Alexis Malila 1974 194 p
Avail: Univ. Microfilms Order No. 75-748

Computer processing provides a potential means for rapid analysis and extraction of useful information from remote sensor data. Two major types of information extraction procedures are compared: recognition processing which involves decision making, and scene attribute estimation which measures or estimates physical and biological characteristics of materials found in observed scenes. Differences in approach and implementation of these two types of procedures are described. A straightforward procedure is described whereby calculation of a scene attribute, based on training information, would be added to conventional recognition processing. Multi-aspect data, collected on multiple passes by a tiltable multispectral scanner are analyzed both empirically and theoretically. A theoretical model was used to predict bidirectional reflectance characteristics for a variety of corn canopies as a basis for determining the utility of multi-aspect data in attribute estimation. Dissert. Abstr.

N75-19625*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM EARTH RESOUCES EXPERIMENT PACKAGE. VOLUME 4: SENSOR PERFORMANCE EVALUATION (S193 R/S) Final Report
Gerald P. Kenney 2 Jan. 1975 127 p refs
(Contract NAS8-24000)
(NASA-CR-141715; MSC-05546-Vol-4) Avail: NTIS HC $5.75 CSCL 14D

The results of the sensor performance evaluation of the 13.9 GHz radiometer/scatterometer, which was part of the earth resources experiment package on Skylab. Findings are presented in the areas of housekeeping parameters, antenna gain and scanning performance, dynamic range, linearity, precision, resolution, stability, integration time, and transmitter output. Supplementary analyses covering performance anomalies, data stream peculiarities, aircraft sensor data comparisons, scatterometer saturation characteristics, and RF heating effects are reported. Results of the evaluation show that instrument performance was generally as expected, but capability degradations were observed to result from three major anomalies. Conclusions are drawn from the evaluation results, and recommendations for improving the effectiveness of a future program are offered. An addendum describes the special evaluation techniques developed and applied in the sensor performance evaluation tasks. Author

N75-19794*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Feb. 1975
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 20 Mar. 1975 3 p EREP
(Contract NAS9-13280)
(E75-10170; NASA-CR-142219; ERIM-101900-50-L) Avail: NTIS HC $3.25 CSCL 05B

N75-19802*# Environmental Research Inst. of Michigan, Ann Arbor.
MULTISPECTRAL SCANNER DATA APPLICATIONS EVALUATION. VOLUME 1: USER APPLICATIONS STUDY Final Report, Jan. - Jul. 1974
F. J. Thomson, J. D. Erickson, R. F. Nalepka, and J. D. Weber Dec. 1974 355 p refs Original contains color illustrations
(Contract NAS9-13386)
(NASA-CR-141689; ERIM-102800-40-F-Vol-1; JSC-09241-Vol-1) Avail: NTIS HC $10.00 CSCL 14B

A six-month systems study of earth resource surveys from satellites was conducted and is reported. SKYLAB S-192 multispectral scanner (MSS) data were used as a baseline to aid in evaluating the characteristics of future systems using satellite MSS sensors. The study took the viewpoint that overall system (sensor and processing) characteristics and parameter values should be determined largely by user requirements for automatic information extraction performance in quasi-operational earth resources surveys, the other major factor being hardware limitations imposed by state-of-the-art technology and cost. The objective was to use actual aircraft and spacecraft MSS data to outline parametrically the trade-offs between user performance requirements and hardware performance and limitations so as to allow subsequent evaluation of compromises which must be made in deciding what system(s) to build. Author

N75-20465# Cambridge Consultants Ltd. (England).
THE STATUS OF MEMORY TECHNOLOGIES UNDER DEVELOPMENT IN EUROPE AND THEIR USE IN SCIENTIFIC AND EARTH RESOURCES OBSERVATION SATELLITES, VOLUMES 1 AND 2 Final Report
D. A. Curtis Aug. 1974 150 p refs
(Contract ESTEC-2127/73-HP)
(ESRO-CR(P)-476-Vol-1/2) Avail: NTIS HC $5.75

The needs of ESRO for a data storage system for a scientific satellite and an earth resources satellite are considered. Recent developments in conventional storage technologies are reviewed, however emphasis is placed on developing technologies in magnetic memory systems (planar thin films, planar ferrites, plated wire); beam access systems (electron beams, optical and optoelectronic systems); and integrated circuit technologies (CCD, amorphous semiconductors, MNOS). Recommendations for memory systems to be used in satellite missions are made.
ESRO

N75-20789*# International Business Machines Corp., Gaithersburg, Md.
ALL-DIGITAL PRECISION PROCESSING OF ERTS IMAGES Final Report
Ralph Bernstein, Principal Investigator Apr. 1975 149 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21716)
(E75-10186; NASA-CR-142335; FSD-75-0009) Avail: NTIS HC $5.75 CSCL 05B

The author has identified the following significant results. Digital techniques have been developed and used to apply precision-grade radiometric and geometric corrections to ERTS MSS and RBV scenes. Geometric accuracies sufficient for mapping at 1:250,000 scale have been demonstrated. Radiometric quality has been superior to ERTS NDPF precision products. A configuration analysis has shown that feasible, cost-effective all-digital systems for correcting ERTS data are easily obtainable. This report contains a summary of all results obtained during this study and includes: (1) radiometric and geometric correction techniques, (2) reseau detection, (3) GCP location, (4) resampling, (5) alternative configuration evaluations, and (6) error analysis.

N75-20812# Ohio Dept. of Transportation, Columbus.
STUDY AND DEVELOPMENT OF ADVANCED SURVEY SYSTEMS AND TECHNIQUES Final Report
Lloyd O. Herd and Ain Laasi Sep. 1974 70 p refs
(PB-238117/6; OHIO-HWY-10-73) Avail: NTIS HC $4.25 CSCL 08B

The purpose of this study was to examine the feasibility of developing a relatively inexpensive technique by which aerial photography could be accomplished using retroreflectors as survey control points. Strobe lights mounted next to the aerial camera and synchronized to the shutter would produce the light that is reflected from the retroreflectors into the camera aperture producing target images on the aerial negative. It was determined that a strobe camera system could be used to obtain target images at 1500 feet flying heights using standard highway delineators as targets. The delineator targets are economical and satisfactory for higher altitude flights if the strobe light candlepower is increased. GRA

08
INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A75-19887 # **Changes in the position of the magnetopause from data obtained with charged particle traps onboard the Prognoz and Prognoz 2 satellites (Variatsii polozheniia magnitopauzy podannym lovushek zariazhennykh chastits na sputnikakh 'Prognoz' i 'Prognoz-2').** K. I. Gringauz, G. N. Zastenker, and M. Z. Khokhlov. *Kosmicheskie Issledovaniia,* vol. 12, Nov.-Dec. 1974, p. 899-902. 11 refs. In Russian.

The daytime position of the magnetopause during the period from April through October 1972 is examined. It is shown that during this period, the position of the magnetopause is closer to its position near minimum solar activity (IMP-1, 1964) than to its position during maximum solar activity (Heos-1, 1969). Data analysis revealed that the dimensions of the magnetosphere diminish with increasing geomagnetic activity. V.P.

A75-20191 Infrared detectors in remote sensing. H. Levinstein (Syracuse University, Syracuse, N.Y.) and J. Mudar (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 6-14. 43 refs. Contract No. N00014-74-C-0285.

A general description of detector parameters is given and detector parameter measurements are considered, taking into account detectivity, spectral response, and speed of response. The characteristics of photon detectors are discussed, giving attention to lead-salt film detectors, InSb and InAs crystalline detectors, doped germanium detectors, doped silicon detectors, ternary alloys, mercury cadmium telluride, lead tin telluride, pyroelectric detectors, and detectors in remote sensing applications. G.R.

A75-20198 System design considerations for advanced scanners for earth resource applications. L. G. Mundie (Rand Corp., Santa Monica, Calif.), R. F. Hummer (Santa Barbara Research Center, Santa Barbara, Calif.), R. L. Sendall (Hughes Aircraft Co., Canoga Park, Calif.), and D. S. Lowe (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 95-103.

Optical mechanical scanners offer a means for producing imagery from earth orbiting platforms in many wavelength bands simultaneously ranging from the visible to about 13 microns. Since the signal is in electrical form, it can be telemetered to earth, where the spectral content of each scene element can be processed to classify features based on their spectral properties. Optical mechanical scanners, electron beam imagery systems, and electronic self-scanning detector arrays are being developed as imaging systems for earth observation from satellites. NASA convened a working group to evaluate the role of these imagers in earth observation programs and to assess R&D requirements for future systems. Some of the system design considerations prepared by the electromechanical scanner panel for use by this working group are presented. (Author)

A75-20199 The military applications of remote sensing by infrared. R. D. Hudson, Jr. (Hughes Aircraft Co., Culver City, Calif.) and J. W. Hudson (Arjay Associates, Encino, Calif.). *IEEE, Proceedings,* vol. 63, Jan. 1975, p. 104-128. 135 refs.

Fundamentals of infrared technology are examined, taking into account targets, transmission medium, illuminator, optical receiver, optical modulator, infrared detector, detector cooler, signal processor, and questions of display. An account is given of early military experience with remote sensing by infrared. Typical military applications of remote sensing by infrared are listed in a table. Strategic systems for early warning in the case of ICBM launches are discussed along with the detection of poison gas under field conditions, aids for the precision delivery of weaponry, and imaging sensors for reconnaissance and surveillance. G.R.

A75-20263 * # **System definition of SEASAT-A, an ocean observation satellite.** J. R. Rose (California Institute of Technology, Jet Propulsion Laboratory, Systems Design and Integration Section, Pasadena, Calif.) and S. W. McCandless (NASA, Special Programs Office, Washington, D.C.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 13th, Pasadena, Calif., Jan. 20-22, 1975, Paper 75-56.* 12 p. Contract No. NAS7-100.

SEASAT will be an earth-satellite system designed to monitor and observe ocean dynamics in order to provide data for real-time use and predictive purposes. SEASAT-A will be a prototype satellite which will provide experience for system development and some operational demonstration capability. The SEASAT-A will use passive and active visible, infrared, and microwave sensing techniques. The payload will include a scanning radiometer (SR) and a scanning multichannel microwave radiometer (SMMR), which are passive sensors, a short-pulse altimeter, a scatterometer, and a synthetic aperture radar, which are active. The major functional elements considered in the definition-phase studies are the sensors, data handling, communications, attitude control, power, orbit adjust, thermal control, structures, and mechanical design. An existing satellite bus, with sensors and sensor modules to be developed, is to be used on SEASAT-A. A.T.S.

A75-20920 # **Characteristics of using electronic scanning methods for aerospace studies of the earth's natural resources (Osobennosti primeneniia elektronnykh metodov s'emki pri aerokosmicheskikh issledovaniiakh prirodnykh resursov zemli).** N. P. Lavrova and B. A. Novakovskii. *Geodeziia i Kartografiia,* Dec. 1974, p. 34-38. In Russian.

Electronic methods, such as radar scanning, used for surveying the earth's resources from space by television suffer from geometrical inaccuracy when compared to conventional direct optical projection methods. The use of mathematical modeling in processing television images in order to eliminate this distortion is discussed. Algorithms which differ considerably from classical photogrammetric algorithms must be used for processing photographs obtained by active and passive electronic scanning methods. A.T.S.

A75-20923 # **Experiment on deciphering aerial photographs having a scale of 1:40,000 for compiling agricultural maps having a scale of 1:10,000 (Opyt deshifrovaniia aerosnimkov masshtaba 1:40000 dlia sostavleniia sel'skokhoziaistvennykh kart masshtaba 1:10000).** I. N. Rychkov and V. N. Zhiriakov. *Geodeziia i Kartografiia,* Dec. 1974, p. 47-49. In Russian.

A75-22530 # **Techniques and applications of remote sensing in India.** T. A. Hariharan (RSMD, Space Applications Centre, Ahmedabad, India). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 75-85.

Multiband aerial photography and thermal infrared radiometric measurements have been used in India in a number of remote sensing feasibility studies with possible applications in agriculture, land use, meteorology, oceanography and geology. Based on the success of these experiments, a more elaborate program has been initiated involving detailed experiments, computerized data processing, sophisticated sensors, etc. While the present emphasis has been on airborne remote sensing, an experiment is already under way to collect data from ATS-6 very high resolution radiometric in collaboration with NASA. This data will be used for meteorological purposes. (Author)

A75-23746 Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis Systems, University of Tennessee, Tullahoma, Tenn., March 25-27, 1974. Conference sponsored by the University of Tennessee. Edited by F. Shahrokhi (Tennessee, University, Tullahoma, Tenn.). Tullahoma, University of Tennessee, 1974. 824 p. $30.

Reports on the application of remote sensing techniques of the surveying of earth resources are presented which contain valuable environmental data in themselves as well as demonstrations of refinements of remote sensing techniques. Some of the studies gathered together include agricultural surveys in the U.S. and India, mapping of pine tree infestment by beetles and defoliation by the gypsy moth, determination of the boundaries and the movement of forest fires in the U.S., water quality surveys and monitoring of ice layer growth and movements in Lake Superior, determination of pollutant flow from sewage plants, and surveys for the design of transportation arteries in and around metropolitan areas.

P.T.H.

A75-23786 * The Penn State ORSER system for processing and analyzing ERTS and other MSS data. G. J. McMurtry, F. Y. Borden, H. A. Weeden, and G. W. Petersen (Pennsylvania State University, University Park, Pa.). In: Remote sensing of earth resources. Volume 3 - Proceedings of the Third Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 25-27, 1974. Tullahoma, University of Tennessee, 1974, p. 721-740. 7 refs. NASA-supported research.

The Office for Remote Sensing of Earth Resources (ORSER) of the Space Science and Engineering Laboratory (SSEL) at the Pennsylvania State University has developed an extensive operational system for processing and analyzing ERTS-1 and similar multispectral data. The ORSER system was developed for use by a wide variety of researchers working in remote sensing. Both photointerpretive techniques and automatic computer processing methods have been developed and used, separately and in a combined approach. A Remote Job Entry (RJE) system permits use of an IBM 370/168 computer from any compatible remote terminal, including equipment tied in by long-distance telephone connections. An elementary cost analysis has been prepared for the processing of ERTS data. (Author)

A75-24089 A possibility for the application-oriented reduction of multispectral data on the example of ERTS-1 (Eine Möglichkeit der anwendungsbezogenen Reduktion multispektraler Daten am Beispiel von ERTS-1). R. Haydn and J. Bodechtel (Zentralstelle für Geo-Photogrammetrie und Fernerkundung, Munich, West Germany). *Raumfahrtforschung*, vol. 19, Jan.-Feb. 1975, p. 7-11. 7 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Based on ERTS-1 MSS data, it is demonstrated that the redundancy between the available bands is dependent on surface features. Therefore redundancy reduction has to be carried out with respect to individual objects or groups of objects. By means of a principal axis transformation, it is possible to define a reduced number of linear band combinations which contain low redundant information for specific applications. This method offers the application of a multispectral scanner system with a high number of spectral bands. (Author)

A75-24143 Problems in the integration of infrared line scanners in high-performance aircraft (Probleme bei der Integration von Infrarot-Streifenabtastern /line scanners/ in Hochleistungsflugzeugen). W. Franke (Messerschmitt-Bölkow-Blohm GmbH, Ottobrunn, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt, Jahrestagung, 7th, Kiel, West Germany, Sept. 17-19, 1974, Paper 74-94.* 10 p. In German. (MBB-UFE-1107)

Infrared line scanners are used to obtain a thermal image of the area overflown by an aircraft. Problems regarding IR reconnaissance systems are related to questions of installation in the aircraft, window design, the occurrence of vibrations, temperature limitations, electromagnetic compatibility, and the adaptation of the sensors to the characteristics of the aircraft avionics system. An optimal integration involves a suitable reduction of the performance-reducing perturbation factors considered. G.R.

A75-24340 * # Remote sensor evaluation model. B. Kerne, N. Shusterman (Operations Research, Inc., Silver Spring, Md.), and R. Drummond (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Operations Research Society of America and Institute of Management Sciences, Joint National Meeting, 46th, San Juan, P.R., Oct. 16-18, 1974, Paper.* 18 p. Contract No. NAS5-21520.

A format is presented that enables the specification of a sensor system configuration, given a set of knowledge requirements to be satisfied by an earth observation satellite. This format, in a modified form, may also be used to determine whether or not a knowledge requirement can be satisfied by existing sensors, and to indicate the need for developing new sensors. It can be applied to large sets of knowledge requirements, so that versatile, multipurpose earth observation sensor systems can be developed. Implementation of the model to a combination of Nimbus G&H and ERTS E&F missions is shown as a test of its viability. The findings are extensively tabulated, and they tend to support the method. S.J.M.

A75-24736 Remote sensing procedures for objective evaluation interpretation. I (Fernerkundungsverfahren für objektive Auswertung. I). D. Lorenz. *Bildmessung und Luftbildwesen*, vol. 43, Mar. 1, 1975, p. 76, 77. In German.

Accurate and preferably automated interpretation of aerial photographs is discussed in general, and scanning with different angles of survey is considered. Two reasons for the limitations of present methods are indicated: (1) inconsistent reproduction of similar land features; and (2) multiple meaning of given spectral reflection bands. Conical scanning and its virtues are described.

S.J.M.

A75-26093 * Antennas for spaceborne microwave radiometers. J. C.-C. Shiue and R. F. Schmidt (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 534-542. 15 refs.

Principles and applications of microwave radiometry to remote sensing of the earth from satellites are reviewed. Examples of some spaceborne radiometer systems currently in use or under consideration are given. The requirements on performance characteristics of microwave antennas for such spaceborne earth sensing radiometers, such as coverage, scanning, spatial resolution, insertion loss, beam efficiency, polarization purity, etc., and their effects on the overall radiometer system performance are discussed. (Author)

A75-26659 Ground systems for receiving, analyzing, and disseminating earth resources satellite data. Paris, International Astronautical Federation, 1974. 95 p. $16.

The paper provides information for the planning, structuring, and costing of ground complexes for receiving, processing, and disseminating earth resources data gathered by orbiting earth resources technology satellites. The system configurations proposed are representative of practical approaches, and can be used as guidelines for implementing earth resources satellite data handling facilities. V.P.

A75-26735 # An estimate of the impact of non-acoustic surveillance sensors on future aircraft avionics systems. L. Helser (Boeing Aerospace Co., Seattle, Wash.). *American Institute of Aeronautics and Astronautics, Digital Avionics System Conference, Boston, Mass., Apr. 2-4, 1975, Paper 75-580.* 7 p. 7 refs.

This paper describes a methodology for prediction of the sensors

and technologies that will furnish the advanced nonacoustic sensor suites for patrol and surveillance aircraft. The impacts of these sensors on future aircraft avionics systems is discussed and estimates of typical interfaces and data rates are given. The major avionics system impacts are seen in the area of 26 MHz multi-sensor display generation and up to 50 Mbps pattern recognition real time data processing. (Author)

A75-27116 A comparison of orbit determination methods for geodetic satellites. B. D. Tapley and B. E. Schutz (Texas, University, Austin, Tex.). In: The use of artificial satellites for geodesy and geodynamics; Proceedings of the International Symposium, Athens, Greece, May 14-21, 1973. Athens, National Technical University of Athens, 1974, p. 523-562. 22 refs. Grant No. AF-AFOSR-72-2233.

Questions of problem formulation are considered and a minimum variance estimate is described. Sequential estimation algorithms are discussed, taking into account a rectified sequential estimation algorithm and a state noise compensation algorithm. Attention is given to a comparison of batch and sequential estimation algorithms, a dynamic model compensation algorithm, a dynamic model compensation estimation algorithm, and aspects of applications to the Apollo 10 and 11 missions. G.R.

A75-27398 * Earth resources experiments and results. J. G. Zarcaro (NASA, Johnson Space Center, Earth Resources Office, Houston, Tex.). In: Skylab and Pioneer report; Proceedings of the Twelfth Goddard Memorial Symposium, Washington, D.C., March 8, 1974. Tarzana, Calif., American Astronautical Society, 1975, p. 103-112.

One of the major objectives of the Skylab Program was to investigate the feasibility of addressing the techniques of resource management through the use of remote sensors from a space platform. To accomplish these investigations, a package of broad-spectrum remote sensors was devised to investigate the extent to which surface features could be interpreted for potential use in understanding and managing the earth's resources. This paper will describe the total system capability needed to accomplish the resource management task; and, for a few specific examples, indicate how the results of EREP will contribute to the on-going development of the total resources system. (Author)

A75-28219 # Some remarks concerning an experiment on remote sensing via tethered balloons (Alcune considerazioni su un esperimento di teledetezione mediante pallone frenato). A. Castellani (CNR, Rome, Italy) and S. Vetrella (Napoli, Università, Naples, Italy). *Istituto Internazionale delle Comunicazioni, Convegno Internazionale delle Comunicazioni, 22nd, Genoa, Italy, Oct. 7-12, 1974, Paper.* 9 p. 6 refs. In Italian.

The use of tethered balloons for remote sensing of terrestrial resources offers several advantages, especially for users with limited economic means. Tethered balloons are relatively inexpensive, while providing a geostationary platform with a recoverable payload. The balloons can observe for longer periods than aircraft, and provide wider coverage. Remote-sensing balloons have potential applications in the following areas: agriculture and forestry, oceanography, meteorology, hydrology, pollution monitoring, and air- and surface-traffic control. A tethered balloon with a volume of 454 cu m, operating at an altitude of 3000 m, and carrying a 40 kg payload is considered. The dynamics of such a balloon are calculated in order to study the feasibility of using it for multispectral photography of the earth's surface. A.T.S.

A75-28776 # Remote sensing from aircraft. A. J. L. Willekens and J. H. Breeman (Nationaal Luchtvaartlaboratorium, Amsterdam, Netherlands). In: International Aerospace Instrumentation Symposium, 8th, Cranfield, Beds., England, Mar. 24-27, 1975, Proceedings. London, Royal Aeronautical Society, 1975. 10 p.

The present work shows how conventional flight test equipment can be used for the recording and processing of remote sensing imagery. Digital tape recording is applied to achieve the high quantitative accuracy required. The use of an infrared line scanner (IRLS) which measures the temperature of the terrain by its radiation and by a sideways-looking airborne radar (SLAR) module is explained. Parameter selection, transducers, signal conditioning, recording, and data processing dealt with by flight tests are considered in detail. S.J.M.

N75-16050*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
DATA COLLECTION SYSTEM: EARTH RESOURCES TECHNOLOGY SATELLITE-1
Saul Cooper, ed. (Army Corps of Engineers) and Philip T. Ryan, ed. Washington 1975 127 p refs Proc. held at Wallops Island, Va., 30-31 May 1973
(NASA-SP-364; LC-74-600160) Avail: NTIS HC $5.75 CSCL 05B

Subjects covered at the meeting concerned results on the overall data collection system including sensors, interface hardware, power supplies, environmental enclosures, data transmission, processing and distribution, maintenance and integration in resources management systems.

N75-16056* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
ERTS-1 DCS TECHNICAL SUPPORT PROVIDED BY WALLOPS STATION
Roger Smith *In its* Data Collection System 1975 p 53-56

CSCL 14B

Wallops Station accepted the tasks of providing ground truth to several ERTS investigators, operating a DCP repair depot, designing and building an airborne DCP Data Acquisition System, and providing aircraft underflight support for several other investigators. Additionally, the data bank is generally available for use by ERTS and other investigators that have a scientific interest in data pertaining to the Chesapeake Bay area. Working with DCS has provided a means of evaluating the system as a data collection device possibly applicable to ongoing Earth Resources Program activities in the Chesapeake Bay area as well as providing useful data and services to other ERTS investigators. The two areas of technical support provided by Wallops, ground truth stations and repair for DCPs, are bridfly discussed. Author

N75-16057* Geological Survey, Bay Saint Louis, Miss.
USDI DCS TECHNICAL SUPPORT: MISSISSIPPI TEST FACILITY
Duane M. Preble *In* NASA. Wallops Station Data Collection System 1975 p 57-64
CSCL 14B

The objective of the technical support effort is to provide hardware and data processing support to DCS users so that application of the system may be simply and effectively implemented. Technical support at Mississippi Test Facility (MTF) is concerned primarily with on-site hardware. The first objective of the DCP hardware support was to assure that standard measuring apparatus and techniques used by the USGS could be adapted to the DCS. The second objective was to try to standardize the miscellaneous variety of parameters into a standard instrument set. The third objective was to provide the necessary accessories to simplify the use and complement the capabilities of the DCP. The standard USGS sites have been interfaced and are presently operating. These sites are stream gauge, ground water level and line operated quality of water. Evapotranspiration, meteorological and battery operated quality of water sites are planned for near future DCP operation. Three accessories which are under test or development are the Chu antenna, solar power supply and add-on memory. The DCP has proven to be relatively easy to interface with many monitors. The large antenna is awkward to install and transport. The DCS has met the original requirements well; it has and is proving that an operation, satellite-based data collection system is feasible. Author

N75-16058* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
AUXILIARY DCP DATA ACQUISITION SYSTEM
Robert V. Snyder *In its* Data Collection System 1975 p 65-72

CSCL 05B

An airborne DCP Data Aquisition System has been designed to augment the ERTS satellite data recovery system. The DCP's are data collection platforms located at pertinent sites. With the appropriate sensors they are able to collect, digitally encode and transmit environmental parameters to the ERTS satellite. The satellite in turn relays these transmissions to a ground station for processing. The satellite is available for such relay duty a minimum of two times in a 24-hour period. The equipment is to obtain continuous DCP data during periods of unusual environmental activity--storms, floods, etc. Two circumstances contributed to the decision to design such a system; (1) Wallops Station utilizes surveillance aircraft in support of rocket launches and also in support of earth resources activities; (2) the area in which Wallops is located, the Delaware and Chesapeake Bay areas, are fertile areas for DCP usage. Therefore, by developing an airborne DCP receiving station and installing it on aircraft more continuous DCP data can be provided from sites in the surrounding areas at relatively low cost. Author

N75-16060* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ERTS-1 DATA COLLECTION SYSTEM: STATUS AND PERFORMANCE
J. Earle Painter *In its* Data Collection System 1975 p 83-96

CSCL 17B

The Data Collection System flown on the first Earth Resources Technology Satellite (ERTS-1) relays earth resources data from remotely located in-situ sensors to Goddard Space Flight Center. Data is received at Goddard at least twice each day from every sensor installation and is distributed to users (who operate the sensors and transmitters) by mail and teletype. The system consists of a data formatting and transmitting unit, called the Data Collection Platform (DCP), a receiver and a retransmitter aboard ERTS-1; and receiving, demodulating and decoding equipment located at the Goldstone, California and Goddard data acquisition stations. Data is transmitted from the data acquisition stations to the ERTS Control Center at Goddard, then to the NASA (ERTS) Data Processing Facility (NDPF) where it is processed and distributed to users. Experience to date indicates that the design of the ERTS-1 Data Collection System is adequate for operational use for 50% of the users and, with minor modifications, could meet the requirements of 75%. Some users will have to augment the system by other data collection techniques to meet their operational requirements. Author

N75-16061* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SUMMARY OF ERTS-1 DATA COLLECTION SYSTEM APPLICATIONS
Vincent V. Salomonson *In its* Data Collection System 1975 p 97-100
CSCL 17B

Geographically, applications were made over nearly the entire area where direct readout could be accomplished using the data acquisition stations in the ERTS-1 system. The extreme areas included Iceland, the Canadian Arctic, Alaska, Hawaii and Central America. In the discipline sense the majority of applications were in the water resources area with other applications being formally and informally reported in meteorology, oceanography, volcano surveillance and forestry. Installation and maintenance of the data collection platforms, as is true with nearly all new systems, was not accomplished without difficulty. On the whole, however, it has gone well enough so that it is agreed that it is a system which is amenable to installation in a variety of physical situations and the installation is accomplished with an ease commensurate with eventual use in an operational system. Author

N75-16062* Geological Survey, Washington, D.C.
USDI REQUIREMENTS AND PROGRAMS
John M. DeNoyer *In* NASA. Wallops Station Data Collection System 1975 p 101-104

CSCL 05A

Interior Department plans for the utilization of data collection systems such as the one on ERTS-1 and others scheduled for future use are very briefly discussed. The savings offerred in manpower, acquisition and dissemination of useful data, and the operational potential of data collection systems are described. Author

N75-16063* Corps of Engineers, Washington, D.C.
US ARMY CORPS OF ENGINEERS REQUIREMENTS AND PROGRAMS
John Jarman *In* NASA. Wallops Station Data Collection System 1975 p 105-106
CSCL 05A

Plans by the Corps of Engineers to utilize data collection systems to support their mission of development, utilization, and conservation of the water resources of the Nation, flood control, water management, hydroelectric power, maintenance of navigable waterways, reservoir construction, and river basin control are briefly addressed. A.L.

N75-16064* National Weather Service, Silver Spring, Md.
NOAA REQUIREMENTS AND PROGRAMS
Allen F. Flanders *In* NASA. Wallops Station Data Collection System 1975 p 107-114

CSCL 05A

Service programs in NOAA that contemplate using the Geostationary Operational Environmental Satellite (GEOS) Data Collection System (DCS) are considered. The GEOS DCS will be operated by the National Environmental Satellite Service of NOAA as an integral part of the national operation environmental satellite program. This plan is concerned with that part of the GEOS program connected with collection and relay of data from remote locations. Service programs include: (1) hydrological data collection; (2) oceanographic data collection; (3) marine observations from data buoys; (4) Tsunami warning service; and (5) meteorological service. A.L.

N75-16065* Environmental Protection Agency, Rockville, Md.
EPA REQUIREMENTS AND PROGRAMS
John D. Koutsandreas *In* NASA. Wallops Station Data Collection System 1975 p 115-120

CSCL 05A

The proposed ERTS-DCS system is designed to allow EPA the capability to evaluate, through demonstrable hardware, the effectiveness of automated data collection techniques. The total effectiveness of any system is dependent upon many factors which include equipment cost, installation, maintainability, logistic support, growth potential, flexibility and failure rate. This can best be accomplished by installing the system at an operational environmental control agency (CAMP station) to insure that valid data is being obtained and processed. Consequently, it is imperative that the equipment interface must not compromise the validity of the sensor data nor should the experimental system effect the present operations of the CAMP station. Since both the system which is presently in use and the automatic system would be in operation in parallel, conformation and comparison are readily obtained. Author

N75-16066* National Aeronautics and Space Administration, Washington, D.C.
NASA REQUIREMENTS AND PROGRAMS
Charles W. Mathews *In its* Data Collection System 1975 p 721-132
CSCL 05A

Conference recommendations for NASA consideration were: (1) continued operation of ERTS-1 for DCS purposes, even after the imaging sensors have ceased to function; and (2) Interagency Coordination Committee on Earth Resources Survey Program

undertake study of the potential for further development of DCS that will lead to the initiation of an operational system to meet national and international requirements. Author

N75-16427* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EARTH OBSERVATIONS
In its Significant Accomplishments in Sci. and Technol. 1975 p 179-233
CSCL 08G

The development of the Earth Resources Technology Satellites for making earth observations from space is discussed. The programmatic elements of the ERTS program are defined. The specific results of the program which are considered are as follows: (1) analysis of snowmelt runoff, (2) analysis of Mississippi River floods of 1973, (3) global ice surveys with an electrically scanning microwave radiometer, (4) the microwave signature of snow fields, (5) analysis of strip mining activities, (6) sea surface studies using microwave techniques during the Bering Sea experiment, (7) cloud types and measurement of rainfall, and (8) performance of various remote sensors. P.N.F.

N75-16581*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM. EARTH RESOURCES EXPERIMENT PACKAGE. SENSOR PERFORMANCE REPORT. VOLUME 7 (S190B): SL2, SL3 AND SL4 EVALUATIONS
Gerald P. Kenney 25 Oct. 1974 122 p refs
(Contract NAS8-24000)
(NASA-CR-141571; MSC-05528) Avail: NTIS HC $5.25 CSCL 22C

The S190B Earth Terrain Camera (ETC) operated acceptably for all of its scheduled EREP passes throughout the SL2 mission. The crew reported no problems in unstowing the camera, changing filters, installing the ETC window in the SAL, or installing the camera onto the window. The ETC was operated for a total of seven times with no failures. The clock on the ETC was checked on DOY 170 (June 19, 1973) and was found to be 30 min. and 58 sec. slower than GMT. The change in time was expected since a similar circumstance was experienced during ETC qualification testing for launch vibration. A leak existed in the seal of the spare magazine to the camera vacuum interface. For EREP passes 08 and 10, black-and-white film EK 3414 (roll no. 82) was installed in this spare magazine. Since there was an audible hiss, the vacuum hose was not connected to the camera. This caused the vacuum platen to be inoperable, resulting in some degradation in resolution for this roll of film. The vegetation of the South American jungle areas proved to be much darker than vegetation found in the United States, and was consequently about 1/2 stop underexposed in all cases. Author

N75-16938 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EARTH'S NATURAL RESOURCES BY THE SPACE SURVEY METHODS (SURVEY OF PROJECTS IN 1973)
Yu. F. Knizhnikov and V. I. Kravtsova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 145-155 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 111-116

N75-16949*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193 Monthly Letter Progress Report No. 14, Nov. 1974
R. K. Moore, Principal Investigator and Arun Sobti Nov. 1974 3 p EREP
(Contract NAS9-13331)
(E75-10130; NASA-CR-142050) Avail: NTIS HC $3.25 CSCL 09D

N75-18460*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
FADING CHARACTERISTICS OF PANCHROMATIC RADAR BACKSCATTER FROM SELECTED AGRICULTURAL TARGETS
Thomas F. Bush and Fawwaz T. Ulaby Dec. 1973 39 p refs
(Contract NAS9-10261)
(NASA-CR-141686; RSL-TR-177-48) Avail: NTIS HC $3.75 CSCL 17I

An experiment was performed to empirically determine the fading characteristics of backscattered radar signals from four agricultural targets at 9 GHz. After a short review of the statistics of Rayleigh fading backscatter, the data processing method and results of the data are analyzed. Comparison with theory shows adequate agreement with the experimental results, provided of course, the targets are modeled in a correct manner. Author

N75-18671*# Block Engineering, Inc., Cambridge, Mass.
EXPERIMENT S-191 VISIBLE AND INFRARED SPECTROMETER Final Report
Eric R. Linnell Jun. 1974 168 p
(Contract NAS9-10975)
(NASA-CR-141692) Avail: NTIS HC $6.25 CSCL 14B

The design, development, fabrication test, and utilization of the visible and infrared spectrometer portion of the S-191 experiment, part of the Earth Resources Experiment Package, on board Skylab is discussed. The S-191 program is described, as well as conclusions and recommendations for improvement of this type of instrument for future applications. Design requirements, instrument design approaches, and the test verification program are presented along with test results, including flight hardware calibration data. A brief discussion of operation during the Skylab mission is included. Documentation associated with the program is listed. Author

N75-18710# Army Engineer Topographic Labs., Fort Belvoir, Va.
REMOTE SENSING: TOTAL OPTICAL COLOR SYSTEM
Robert K. Brooke, Jr. Jun. 1974 36 p refs
(DA Proj. 4A6-62707-D-853; DA Proj. 4A6-62707-A-854)
(AD-A001464; ETL-ETR-74-3; Rept-2) Avail: NTIS CSCL 08/2

An unconventional photographic technique developed by Technical Operations, Incorporated, was evaluated for possible application to U.S. Army Engineer Topographic Laboratories' programs. Areas of interest were aerial acquisition, image enhancement and display, color separation, map reproduction and data storage and retrieval. A special camera/viewer system was designed under Contract No. DAAK02-70-C-0135 and tested for a number of the above applications. The test results indicate applicability for aerial acquisition and enhancement and display; however, conclusive evidence verifying the utility of the technique requires equipment specifically directed at the aerial acquisition requirement. GRA

N75-19804*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM EARTH RESOURCES EXPERIMENT PACKAGE. VOLUME 5: SENSOR PERFORMANCE EVALUATION (S193 ALT) Final Report
Gerald P. Kenney 2 Jan. 1975 147 p
(Contract NAS8-24000)
(NASA-CR-141716; MSC-05546-Vol-5) Avail: NTIS HC $5.75 CSCL 14B

The results are summarized of S193 altimeter sensor performance evaluation based on data presented to the sensor performance evaluation interim reports. The results of additional analyses of S193 altimeter performance are presented, and techniques used in sensor performance evaluation are described. Significant performance degradation identified during the Skylab missions and the performance achieved are described in terms of pertinent S193 altimeter parameters. The additional analyses include final performance analyses completed after submittal of the SL4 interim sensor performance evaluation reports, including

completion of detailed analyses of basic performance parameters initiated during the interim report periods. Author

N75-19815# Brock (Robert H., Jr.) Inc., Camillus, N.Y.
PHOTOMETRIC EVALUATION OF SENSORS ***Final Report, May 1972 - Jun. 1974***
Robert H. Brock, Jr. Oct. 1974 128 p refs
(Contract F30602-72-C-0449)
(AD-A002150; RADC-TR-74-256) Avail: NTIS CSCL 08/2

The report reviews the procedures used by the Rome Air Development Center during the past several years for the photogrammetric evaluation of sensors. They are described and evaluated with respect to their accuracy, cost-effectiveness, and ease of implementation. Two basic systems were evaluated: a ground-based PC-1000 camera system and an airborne camera system. In each case the general capability of the camera is considered, the calibration of the camera system is discussed, and actual tests with each system were completed and analyzed. GRA

N75-20810# *Army Foreign Science and Technology Center,* Charlottesville, Va.
DEVELOPMENT OF PHOTOGRAMMETRY IN THE SOVIET UNION
16 May 1974 27 p Transl. into ENGLISH from Geodeziya Kartografiya (USSR), no. 12, 1973 p 22-30
(AD-A002761; FSTC-HT-23-0215-74) Avail: NTIS CSCL 08/2

The significance of photogrammetry is discussed and its development traced in the Soviet Union from pre-Revolutionary times. Development after 1918 is divided into three periods (1918-1929, 1930-1945, 1946-present) and each period is discussed in terms of advances in technology and application, with special attention to those developed within the Soviet Union. GRA

09
GENERAL

Includes economic analysis.

A75-22526 Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. Seminar sponsored by COSPAR, INPE, UNEP, ICSU, CIIE, and COSTED. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974. 372 p.

Papers are presented dealing with the application of remote sensing techniques in the surveying or earth resources in developing countries. These techniques are described as applied to specific problems and are also presented from the viewpoint of their effectiveness as a basis for socio-economic development. Some of the topics covered include the application of ERTS results in the Republic of South Africa, acquisition and use of ERTS-1 data for resources management in Brazil, hydrogeologic evaluation of ERTS and EREP data for the pampa of Argentina, human settlement patterns in relation to resources of lesser developed countries, tectolinear interpretation of an ERTS-1 mosaic of La Paz area in southwest Bolivia, and satellite geodesy in developing countries. P.T.H.

A75-22527 * # The first Earth Resources Technology Satellite - Nearly two years of operation. W. Nordberg (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 6-23. 7 refs.

A brief status report is given of the ERTS-1 satellite system as of June, 1974, and some applications of the ERTS-1 images are discussed. The multispectral images make it possible to identify or measure the quality and composition of water, the potential water content of snow, the moisture and possible composition of soils, the types and state of vegetation cover, and factors relating to stresses on the environment. The orthographic view of the earth provided by the satellite makes it possible to rapidly produce thematic maps, on a scale of 1:250,000, of most areas of the world. The regular, repetitive coverage provided by ERTS-1 every 18 days is important in areas such as water-supply and flood-damage studies. The use of ERTS-1 imagery for land-use planning, wetlands surveying, assessing marine resources, and observing processes such as desertification in the African Sahel is discussed. A.T.S.

A75-22543 # An economic evaluation of ERTS data utilization in developing countries. R. A. Summers (System Planning Corp., Arlington, Va.), E. J. Greenblat (Mathematica, Inc., Princeton, N.J.), and D. S. Lowe (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 322-339. Research supported by the Agency for International Development.

The utilization of ERTS data in 18 developing countries was reviewed and evaluated. Detailed evaluations, involving benefit/cost analyses, were made for projects in Kenya, Thailand, Bolivia, and Botswana. Selected case studies were analyzed, including rice-crop forecasting in Thailand, rangeland management in Kenya, and noncountry-specific studies of watershed management, cartographic applications, and the potential from utilization of the ERTS imagery for mineral exploration. The preliminary findings of the study indicate that substantial benefits can accrue to developing countries from the use of ERTS data in cartographic mapping, mineral exploration, crop forecasting, water-resources management, and range management. Appropriate technical assistance in interpreting and applying ERTS data to decisionmaking should be provided to the users so that the desired benefits can be obtained at low cost levels. A.T.S.

A75-22544 # Statistical investigation of ERTS-data on redundancy with respect to special selected surface features. J. Bodechtel, R. Dittel, and R. Haydn (Zentralstelle für Geophotogrammetrie und Fernerkundung, Munich, West Germany). In: Seminar on Space Applications of Direct Interest to Developing Countries, São José dos Campos, Brazil, June 16-19, 1974, Proceedings. Volume 2. São José dos Campos, Brazil, Instituto de Pesquisas Espaciais, 1974, p. 355-368.

On the basis of ERTS-MSS data, the statistical correlation between the available 4 bands is investigated with regard to several features. The possibility of reducing data rates by a supervised principal component transformation for operational application is discussed. (Author)

A75-23132 * # Present and future NASA earth resources related satellite programs. G. A. Branchflower (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 121-148.

Ongoing and presently contemplated earth resources related space programs are discussed, and the evolution of present programs is presented. Nimbus, ERTS (earth resources technology satellite), Skylab, and GEOS C (geodetic earth-orbiting satellite C) are the ongoing programs described. Future projects explained comprise ERS (earth resources survey operational satellite), Nimbus G, EOS (earth observatory satellite), SEASAT (sea satellite), and shuttle sortie. The objectives and instrument payloads for each of the missions are detailed. A number of high-altitude color satellite photographs supplements the treatment. S.J.M.

A75-23134 # Systems approach to the use of remote sensing. D. Landgrebe (Purdue University, Lafayette, Ind.). In: Remote sensing of earth resources; Summer Seminar, Tarbes, Hautes-Pyrénées, France, August 21-September 20, 1973, Proceedings. Paris, Centre National d'Etudes Spatiales, 1974, p. 163-192. 19 refs.

This paper discusses earth resources information systems which utilize satellites as sensor platforms. It is pointed out that information may be derived by sensing and analyzing the spectral, spatial, and temporal variations of electromagnetic fields emanating from the earth's surface. After giving an overview system organization, the two broad categories of system types are discussed. These are systems in which high-quality imagery is essential and those which are more numerically oriented. The multispectral approach and pattern recognition are described as an example data analysis procedure for numerically oriented systems. The steps necessary in using a pattern recognition scheme are described and illustrated with data obtained from Apollo 9. (Author)

A75-24667 Earth Environment and Resources Conference, Philadelphia, Pa., September 10-12, 1974, Digest of Technical Papers. Conference sponsored by the U.S. Environment and Resources Council, IEEE, IES, and University of Pennsylvania. Edited by L. Winner. New York, Lewis Winner, 1974. 179 p. Members, $20.; nonmembers, $25.

Forecasts of future programs, status of ongoing research, present models and examples, and virtues of past projects are assessed by representatives of industry, universities, professional societies, and government agencies. Space imagery results, environmental impact, weather and climate, environmental pollution, remote sensing instru-

mentation, management techniques, air pollution, energy and resource consumption, land resources, energy and resource recovery from solid waste, plant and animal resources, electromagnetic environment, and water resources are discussed. Specific topics treated include: remote sensing of geologic hazards in Alabama, flood applications of the ERTS satellite, anthropogenic desertification by high-albedo pollution - observations and modeling, urban-induced weather modification, removal of organic pollutants by adsorptive bubble separation processes, acoustic sounders for predicting air pollution over cities, and land use inventory of the Great Lakes Basin by computer analysis of satellite data.

S.J.M.

A75-26034 * ***Modular design of the earth observatory satellite /EOS/.*** T. L. Fischetti (NASA, Office of Applications, Washington, D.C.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 11-18.

The next generation of earth observation satellites are planned to carry advanced optical and microwave sensors for application studies. Design concepts have evolved to a modular spacecraft systems approach which is compatible with Delta, Titan, and Space Shuttle launches, with in-flight Shuttle maintenance, and with Shuttle retrieval. Use of this modularized spacecraft for a variety of low-earth orbiting missions can provide high reliability at reduced costs. (Author)

A75-26088 **The polar orbiting environmental satellite system.** A. Schwalb (NOAA, National Environmental Satellite Service, Washington, D.C.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 483-489.

The first spacecraft of the current generation of NOAA operational polar orbiting satellites was launched on October 15, 1972. Primary payload instruments are the Scanning Radiometer, Vertical Temperature Profile Radiometer and the Very High Resolution Radiometer. General information about the spacecraft, its orbit and instruments is presented. (Author)

A75-26090 **The future polar orbiting environmental satellite system.** G. H. Ludwig (NOAA, National Environmental Satellite Service, Washington, D.C.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 498-502.

The third generation polar orbiting operational environmental satellite system (TIROS-N/NOAA) is being designed to provide improved data for meteorological prediction and warning, oceanographic and hydrologic services, and space environment monitoring. Its major advances over the present system will be in providing higher accuracy and increased yield of atmospheric temperature and water vapor soundings, increased spectral radiometric information for more accurate sea surface temperature mapping and delineation of melting snow and ice fields, a remote measuring platform location and data collection capability, and increased proton, electron, and alpha particle spectral information for improved solar disturbance prediction. The present direct broadcast services, including night and day cloud cover and sounder data transmission, will be continued. (Author)

A75-26101 * ***Synchronous Earth Observatory Satellite /SEOS/.*** L. S. Walter (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: EASCON '74; Electronics and Aerospace Systems Convention, Washington, D.C., October 7-9, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 631-636.

NASA/GSFC is currently studying the applications and technical requirements for a Synchronous Earth Observations Satellite (SEOS). Such a satellite would combine the relatively high resolution and multi-spectral capability of the Earth Resources Technology Satellite (ERTS) with the on-station continuous monitoring of the Synchronous Meteorological Satellite (SMS). SEOS capability is geared to perform disaster warning of tornadoes and floods as well as to monitor transient phenomena affecting earth resources (e.g., green waves and algae blooms). The heart of the system is a Large Earth Survey Telescope (LEST) which has a designed 1.5 meter diameter. Spectral bands in the visible, near- and far-infrared have been selected to optimize SEOS utility. A microwave sounder will be used in conjunction with the LEST for meteorological applications. (Author)

N75-16404# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
AN ECONOMIC EVALUATION OF THE UTILITY OF ERTS DATA FOR DEVELOPING COUNTRIES, VOLUME 1 Final Report, 30 Jun. 1973 - 30 Jun. 1974
D. S. Lowe, R. A. Summers, and E. J. Greenblat Aug. 1974 101 p
(Contract AID/CM/ta-C-73-38)
(PB-236600/3; ERIM-105100-8-F) Avail: NTIS HC$5.25 CSCL 05C

The utilization of ERTS-1 data in 18 developing countries is reviewed and evaluated. This overall assessment is supported by more detailed economic evaluations in selected countries. Two quantitative economic evaluations were conducted, one on the benefits to be derived from improved rice-crop forecasting in Thailand and the other on benefits stemming from improved range-carrying-capacity estimations in Kenya. Additional qualitative evaluations were made of potential improvements in mineral exploration, water resources management, and cartographic mapping. These benefits can be accrued at acceptably low cost levels, provided that appropriately timed and scaled technical assistance is provided. GRA

N75-16405# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
AN ECONOMIC EVALUATION OF THE UTILITY OF ERTS DATA FOR DEVELOPING COUNTRIES. VOLUME 2: APPENDICES Final Report, 30 Jun. 1973 - 30 Jun. 1974
D. S. Lowe, R. A. Summers, and E. J. Greenblat Aug. 1974 311 p
(Contract AID/CM/ta-C-73-38)
(PB-236601/1; ERIM-105100-8-F) Avail: NTIS HC$9.25 CSCL 05C

The utilization of ERTS-1 data in 18 developing countries is reviewed and evaluated. An overall assessment is supported by more detailed economic evaluations in Bolivia, Thailand, Kenya and Botswana. While organizational and technical progress varies widely, it seems clear that substantial benefits can accrue to these countries in cartographic mapping, mineral exploration, water resources management, range management, crop forecasting, and rural/regional development. GRA

N75-16961 *# Mathematica, Inc., Princeton, N.J.
PRINCIPLES OF COST-BENEFIT ANALYSIS FOR ERTS EXPERIMENTS, VOLUMES 1 AND 2
31 Aug. 1973 134 p refs Sponsored by NASA
(NASA-CR-141225) Avail: NTIS HC $5.75 CSCL 05C

The basic elements of a cost-benefit study are discussed along with special considerations for ERTS experiments. Elements required for a complete economic analysis of ERTS are considered to be: statement of objectives, specification of assumptions, enumeration of system alternatives, benefit analysis, cost analysis nonefficiency considerations, and final system selection. A hypothetical cost-benefit example is presented with the assumed objective of an increase in remote sensing surveys of grazing lands to better utilize available forage to lower meat prices.

F.O.S.

N75-18691*# General Electric Co., Philadelphia, Pa. Space Div.
EARTH RESOURCES TECHNOLOGY SATELLITE OPERATIONS CONTROL CENTER (OCC). ERTS-B FLIGHT ACTIVATION PLAN
31 Dec. 1974 142 p
(Contract NAS5-21808)
(NASA-CR-142227; Doc-74SD4260) Avail: NTIS HC $5.75 CSCL 22A

Included in this plan are general objectives through Day 7, operational guidelines and restraints. Following the activation of all subsystems (through Day 3), special series of payload operations were performed to obtain data samples for the different combinations of exposure/gain settings. This took place from Day 4 through Day 7. The Orbit Adjust was employed to perform vernier corrections after the orbit had been defined. The orbit data was collected through Day 3, with the corrections being made from Day 4 through Day 7. ERTS command auxiliary memory (ECAM) was turned on in Day 3 and the memory dumped to a narrow band tape recorder. A verification of memory was done in the off line mode. ECAM was not used in a payload support mode until Day 7. Author

N75-18700*# ECON, Inc., Princeton, N.J.
SEASAT ECONOMIC ASSESSMENT
Kenneth Hicks and William Steele Oct. 1974 406 p refs
(Contract NASw-2558)
(NASA-CR-142208; Rept-74-2001-11) Avail: NTIS HC $10.50 CSCL 08E

The SEASAT program will provide scientific and economic benefits from global remote sensing of the ocean's dynamic and physical characteristics. The program as presently envisioned consists of: (1) SEASAT A; (2) SEASAT B; and (3) Operational SEASAT. This economic assessment was to identify, rationalize, quantify and validate the economic benefits evolving from SEASAT. These benefits will arise from improvements in the operating efficiency of systems that interface with the ocean. SEASAT data will be combined with data from other ocean and atmospheric sampling systems and then processed through analytical models of the interaction between oceans and atmosphere to yield accurate global measurements and global long range forecasts of ocean conditions and weather. Author

N75-18704# Geological Survey, Reston, Va. Office of International Geology.
THE FIRST USGS/AID INTERNATIONAL TRAINING COURSE ON REMOTE SENSING Final Report
R. W. Fary, Jr. Apr. 1973 44 p ref Course held at Sioux Falls, S.D., Jun. 1973 Sponsored in part by Agency for Intern. Develop., Washington, D.C.
(PB-236512/0; USGS-IR-NC-35) Avail: NTIS HC $3.75 CSCL 05I

The first USGS/AID international training course in remote sensing was designed to prepare resources agencies of other countries to use remote sensor data in support of resources and land use analysis and management operations. The Earth Resources Technology Satellite (ERTS-1) data were emphasized. Subjects included cartography, geography, geology, agriculture/forestry/range, hydrology, and estuarine and coastal processes and the use of ERTS data as bases for multidisciplinary and interdisciplinary cooperation toward the solution of resources and environmental problems. GRA

N75-20155*# National Aeronautics and Space Administration, Washington, D.C.
RESEARCH AND TECHNOLOGY OPERATING PLAN SUMMARY: FISCAL YEAR 1975 RESEARCH AND TECHNOLOGY PROGRAM
1975 197 p
(NASA-TM-X-70410) Avail: NTIS HC $7.00 CSCL 05B

Summaries are presented of Research and Technology Operating Plans currently in progress throughout NASA. Citations and abstracts of the operating plans are presented along with a subject index, technical monitor index, and responsible NASA organization index. Research programs presented include those carried out in the Office of Aeronautics and Space Technology, Office of Energy Programs, Office of Applications, Office of Space Sciences, Office of Tracking and Data Acquisition, and the Office of Manned Space Flight. M.J.S.

N75-20804*# General Electric Co., Philadelphia, Pa. Space Div.
ERTS 1 FLIGHT EVALUATION REPORT, 23 JULY 1974 TO 23 OCTOBER 1974
31 Dec. 1974 130 p refs
(Contract NAS5-21808)
(NASA-CR-143706; Doc-74SD4255) Avail: NTIS HC $5.75 CSCL 22B

Analyses of ERTS-1 performance during the ninth quarter of its operation are presented. Topics discussed include orbital parameters, power subsystem, attitude control subsystem, command/clock subsystem, telemetry subsystem, orbit adjust subsystem, magnetic moment compensating assembly, unified S band/premodulation processor, electrical interface subsystem, thermal subsystem, narrowband tape recorders, wideband telemetry subsystem, attitude measurement sensor, wideband video tape recorders, return beam vidicon subsystem, multispectral scanner subsystem, and data collection system. M.J.S.

N75-20813# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 1. EXECUTIVE SUMMARY Final Report
22 Nov. 1974 51 p Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-08-0001-13519)
(PB-238703/3; USGS-DO-75-001) Avail: NTIS HC $4.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

A study to evaluate the economic, environmental, and social costs and benefits of future Landsat satellite systems is summarized. The results and conclusions of the analysis, background of the study, and methods of analysis are covered. The expected benefits in such applications areas as agriculture, water resources, land use planning, and rangeland management are summarized. Limitations of this and other cost-benefit analyses as techniques for prediction of real world results are also discussed. GRA

N75-20814# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 2. SUMMARY OF BENEFITS EVALUATIONS Final Report
22 Nov. 1974 323 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-08-001-13519)
(PB-238704/1; USGS-DO-75-002) Avail: NTIS HC $9.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

Benefits from broad areas of ERS data application corresponding roughly to the economic sector rather than scientific discipline were evaluated for: agricultural production, water resources management, rangeland management, forestry management, land use planning and management, environmental management, geologic and mineral resources management, marine resources management, and disaster warning and relief. GRA

N75-20815# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 3. ALTERNATE SYSTEMS EFFECTIVE-

NESS ANALYSIS Final Report
22 Nov. 1974 175 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-08-0001-13519)
(PB-238705/8; USGS-DO-75-003) Avail: NTIS HC $6.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

Imaging systems having essentially equivalent spectral coverage and resolution are analyzed, and include the following: continuous coverage by two satellites; continuous coverage by a single Landsat-like satellite; and an all aircraft system. Benefits in the applications areas are examined and modified in light of cloud cover problems. Costs of the candidate systems are delineated on the basis of 18-day coverage that mimics Landsat-type coverage. GRA

N75-20816# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 4. CAPABILITIES TO DERIVE INFORMATION OF VALUE WITH ERS DATA *Final Report*
22 Nov. 1974 346 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-08-0001-13519)
(PB-238706/6; USGS-DO-75-004) Avail: NTIS HC $9.50 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

Technical capability of the ERS to derive information of potential value and identification of those characteristics of ERS information that influence its value or demand for its utilization were examined in light of user requirements for specific application to agricultural production, water resources management, rangeland management, forestry management, land use planning and cartographic mapping, environmental management, geologic and mineral resources management, marine resources and ocean surveys, and meteorology. GRA

N75-20817# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 5. APPROACH AND METHODS OF ANALYSIS *Final Report*
22 Nov. 1974 102 p Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-0001-13519)
(PB-238707/4; USGS-DO-75-005) Avail: NTIS HC $5.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

The objectives, scope, approach, and methods of economics are presented for the general reader along with the methodological foundations of the primary economic analysis. GRA

N75-20818# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. VOLUME 6. ANALYSIS OF DISTRIBUTIONAL, *ENVIRONMENTAL, SOCIAL, AND INTERNATIONAL* IMPACTS Final Report
22 Nov. 1974 172 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md. 6 Vol.
(Contract DI-14-08-0001-13519)
(PB-238708/2; USGS-DO-75-006) Avail: NTIS HC $6.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08F

An operational ERS system is analyzed to determine if the distribution of net benefits is significantly different from the existing distribution of income; to identify potential impacts on the management or preservation of natural resources and ecological systems; to project potential changes in employment, quality of life, and other social effects for affected populations and groups; and to evaluate the economic impact on the U.S. of the use of ERS data relating to foreign countries. These perspectives provide additional information which should be considered in any public investment decision. GRA

N75-20819# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. APPENDIX 1. AN ANALYSIS OF THE BENEFITS AND COSTS OF AN IMPROVED CROP ACREAGE FORECASTING SYSTEM UTILIZING EARTH RESOURCES SATELLITE OR AIRCRAFT INFORMATION Final Report
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(PB-238709/0; USGS-DO-75-007-App-1) Avail: NTIS HC $5.75 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 02D

The development of crop acreage forecasting is investigated. In the absence of estimates of the overall accuracy of ERS crop acreage estimates, benefits are estimated as a function of error over a range of improvements. Inventory adjustment benefit estimates are made using a previously developed model. GRA

N75-20820# Earth Satellite Corp., Washington, D.C.
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22 Nov. 1974 229 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-0001-13519)
(PB-238710/8; USGS-DO-75-008-App-2) Avail: NTIS HC $7.50 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08L

Snow mapping and related snow runoff forecasts are investigated. Potential benefits are demonstrated for use of improved runoff forecasts in reservoir regulation, based on a simulation of the impact of error in forecasts upon determination of flood storage allocation and hydropower generation. GRA

N75-20821# Earth Satellite Corp., Washington, D.C.
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(PB-238711/6; USGS-DO-75-009-App-3) Avail: NTIS HC $7.50 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 02D

The case study was selected because of demonstrated capability to identify and stratify broad vegetation classes, to monitor trends in range condition, and to monitor forage production and ephemeral range readiness, and because current rangeland management information systems indicated benefits could be substantial. Analysis of current and future systems indicates rangeland inventories could improve, rangeland monitoring could be accomplished, and range feed condition reports could be improved. GRA

N75-20822# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. APPENDIX 4. AN ANALYSIS OF THE BENEFITS AND COSTS IN FORESTRY UTILIZING EARTH RESOURCES SATELLITE OR AIRCRAFT INFORMATION Final Report
22 Nov. 1974 213 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-0001-13519)

(PB-238712/4; USGS-DO-75-010-App-4) Avail: NTIS HC $7.25 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 02F

Forest inventory, forest protection, and monitoring forest practices are investigated. Capabilities of ERS alternatives to provide forest management information are compared with ERS system capabilities in making an initial determination of potential utilization of ERS information. Benefit estimation is cast in an information theory framework and on a willingness-to-pay criterion. GRA

N75-20823# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. APPENDIX 5. AN ANALYSIS OF COSTS AND BENEFITS FROM USE OF ERS DATA IN STATE LAND USE PLANNING Final Report
22 Nov. 1974 298 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-0001-13519)
(PB-238713/2; USGS-DO-75-011-App-5) Avail: NTIS HC $8.75 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 14A

Land use planning activities at the State level are studied. The types of information of value in future State land use planning are projected as are data sources, techniques, and unit costs of supplying information for conventional systems and those systems combined with ERS data. Estimated benefits focused on rate of data acquisition and the impact of differences in the unit costs of data acquisition with or without ERS data. GRA

N75-20824# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEM. APPENDIX 6. AN ANALYSIS OF THE BENEFITS AND COSTS FROM THE USE OF ERS DATA IN ENVIRONMENTAL ANALYSIS Final Report
22 Nov. 1974 145 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-0001-13519)
(PB-238714/0; USGS-DO-75-012-App-6) Avail: NTIS HC $5.75 HC also Available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 14A

The Landsat environmental monitoring capabilities in disturbed lands, wetlands, water bodies, and atmosphere are reviewed. It appears that ERS information would complement rather than replace in situ monitoring data, primarily guiding ground and aircraft monitors to the more critical areas. ERS data are recognized also to have potential value for contributing to the development of ecosystem models. GRA

N75-20825# Earth Satellite Corp., Washington, D.C.
EARTH RESOURCES SURVEY BENEFIT-COST STUDY. ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND BENEFITS OF FUTURE EARTH RESOURCES SURVEY SYSTEMS. APPENDIX 7. LIVING MARINE RESOURCES BROAD AREA ANALYSIS Final Report
22 Nov. 1974 28 p refs Prepared in cooperation with Booz-Allen Applied Research, Inc., Bethesda, Md.
(Contract DI-14-08-0001-13519)
(PB-238715/7; USGS-DO-75-013-App-7) Avail: NTIS HC $3.75 HC also available from NTIS $72.00/set of 13 reports as PB-238702-SET CSCL 08A

Living marine resources are identified as a potential case study, but realization of benefits by fishing industry j is contingent upon the solution of three problem areas: communications; international constraints; and bioeconomics modeling. The Landsat capabilities for obtaining information significant to fisheries is determined. GRA

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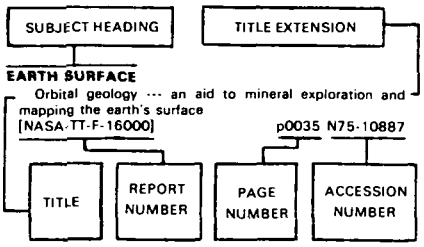

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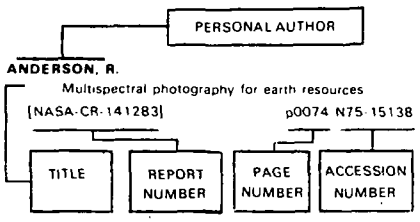

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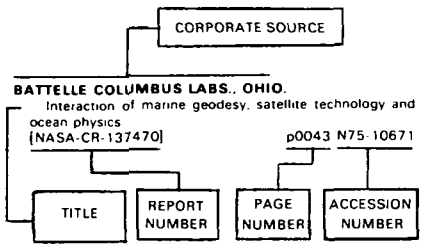

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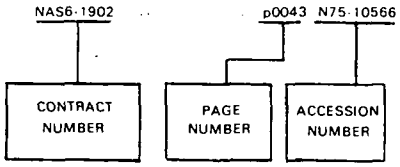

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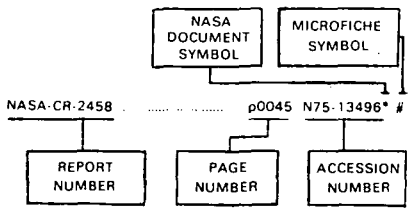

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15. Supplementary Notes

16. Abstract

This bibliography lists 484 reports, articles, and other documents introduced into the NASA scientific and technical information system between April 1975 and June 1975. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

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